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the OIL AND GAS JOURNAL

DECEMBER 15, 1958

What the Memphis ruling means

Pipeline construction will jump, new big reserves of gas will be dedicated to eastern consumers. p. 63

Reef discovery adds luster to Paradox p. 66

Independents to push for wider spacing p. 68

LACT's hidden opportunity—stripper leases p. 70

World demand to nearly double in 10 years p. 74

Chemicals in Mud HOW • WHY • WHERE • WHEN THEY ARE USED p. 90

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Greetings from

HALLIBURTON

OIL WELL CEMENTING COMPANY

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Dec. 15, 1958

There's a good reason for delay in the new import plan:

A mandatory approach is now being held up as the best solution to the tough problem. But insiders are reluctant to buy it. They fear such a step will put the oil industry on the road to complete government control.

Result is cabinet committee members have backed off and now are taking an entirely new look at the question.

Prospects are present voluntary import plan may be extended past first of year while more work is done.

Their dilemma lies between a voluntary plan which is leaking badly or putting the industry under the yoke of federal control. In the final solution, don't rule out the possibility of a tariff or assignment of quotas to producing countries.

▼ ▼ ▼

Pipelining prospects for 1959 are zooming.

Memphis decision of the Supreme Court is providing spark. But even before that, prospects were good. The busiest winter construction season in years is carrying over into 1959.

But with the legal cloud removed from rate increases, pipeliners now believe old project plans will be taken off the shelf and new promotions started. They see a return to strong growth rates in the natural-gas industry.

All the elements are now available for a big 1959: Plenty of gas, a strong market, and now freedom and ability to serve the market (p. 63).

▼ ▼ ▼

A new fabric bearing that requires no lubrication has caught the attention of petroleum marketers.

Trade sources in Detroit say American Metal Products' Fiberglide bearing may mean the 1960 entry of cars that don't have to be greased.

Reports are that Ford, Chrysler, and General Motors all are studying the development and that Ford may be the first to use the bearings. Spokesmen for the Big Three auto firms told The Journal, however, no such development is planned now for 1960 models.

The bearing consists of a spherical ball. Around this, a woven polytetrafluoroethylene (Teflon) fiber socket is

molded during assembly into a metal housing. Teflon is one of the slipperiest materials known and has the lowest coefficient of friction of any fiber.

The bearing could mean possible loss of grease sales to the petroleum industry. But more important, autos in service stations for a grease job are candidates for plenty of other products and services.

One major marketer called a policy meeting last week to discuss the possibility of eliminating the lube bays in the designs for its future service stations.

▼ ▼ ▼

Frigid weather is putting real strength in the heating-oil and LPG markets (p. 176).

Sales of distillates, propane, heavy fuel oil have zoomed. Movement of gasoline on other hand has slowed. Supplies are adequate for the sudden spurt and prices are firming.

▼ ▼ ▼

New trouble in the Middle East:

Fires resulting from electrostatic spark ignition of floating-roof tanks have become a matter of major interest to Middle East oil operators.

A note from George T. Prussing, regional petroleum officer, American Embassy, Beirut, Lebanon, adds: It has been the impression that bonding between floating roofs and shells has been of no use because fires have resulted in tanks which have had such bonds.

He says: "If anyone has any additional information on this peculiar subject I should be grateful to exchange data with him."

▼ ▼ ▼

Look for Standard Vacuum to plunge into Australian exploration.

Deal is brewing between Standard Vacuum and Delhi Australian-Santos, Ltd. over 170-million acre concession in states of South Australia and Queensland.

Reliable sources indicate deal will be signed within a few weeks. It calls for Standard Vacuum to spend $15 million over next 10 years exploring the concession. In return, it will get half interest. Delhi Australian Petroleum and Santos each will retain one-fourth interest.

Principals were flanging up details in meetings last week in Delhi offices in Dallas.

A major new oil province in the Paradox basin could be in the making for southeastern Utah.

Within the next few weeks, nine wildcats whirring away in the region should tell the story (p. 151).

Interest centers around discovery of a reef on the west

flank of the basin by a TGT wildcat (p. 66). Well was not commercial but it had a number of important shows and revealed a wealth of geological information.

Mecom interests of Houston report they're still in preliminary stages of any Alaskan adventure.

Mecom explorationists still are studying photogeology reports of Alaska. They have no definite plans to move rigs into the new state immediately.

Alaskan sources had reported Mecom bought ferryboats in California to move three rigs to the northland. But the Mecom spokesman says his company only looked at the ferryboats, now has some rigs winterized in Texas. When the equipment is moved to Alaska, it probably will go by barge.

Drilling notes: Skelly's remote Cimarron County wildcat has pushed Oklahoma production to westernmost point. The 240-bbl. daily pumper is in Dalhart basin, 8 miles south of the Colorado line...New drilling-depth record for Four Corners has been set by Conoco's Paradox Valley wildcat in Montrose County, Colorado. It's now at 14,406 ft....Three new discoveries in Powder River and Wind River basins are keeping the exploration spotlight on Wyoming.

▼ ▼ ▼

Battle for wider well spacing is attracting support of Texas independents. They are giving real impetus to the new Oil Industry Conservation Forum.

Independents feel that with wider spacing there would be greater allowables per well. This means greater income per well and more money to invest in wildcatting for new reserves (p. 68).

New change in Atomic Energy Commission regulations may benefit oil industry.

AEC now will permit broader uses of uranium 233, uranium 235, and plutonium within this country. Previously the possession and use of these materials were limited to research and development, medical therapy, and the fueling of atomic reactors.

The AEC itself points out one benefit from the new rule. It says plutonium-beryllium neutron sources may find a use in oil-well logging. New regulation will permit licensing for this purpose.

▼ ▼ ▼

U. S. ammonia supply and demand should be in balance by 1961, according to a new analysis of the market.

Here's the outlook:

...Consumption should increase at an annual rate of about 10% to 4,176,000 tons by 1961.

...Capacity, now 4,089,000 tons yearly, will move up to 4,165,000 tons by 1961.

By then the serious overcapacity which has plagued the industry should be over unless a new round of plant expansion should set in (p. 109).

▼ ▼ ▼

LACT can also save money on stripper leases, previously believed too small to take advantage of automation.

Tests show that savings are made by eliminating vapor losses which cost the producer both volume and gravity. The prospect is best where small leases can be unitized and production delivered to a central LACT unit (p. 70).

Helping this trend is the development of a 3-bbl. meter tank unit.

▼ ▼ ▼

Move is under way in Canada to open up gas export market.

Arthur Smith, Conservative member of parliament for Calgary South, is urging the cabinet to authorize the Board of Transport Commissioners to process gas export applications.

Western Canadians fear gas markets will be lost if they have to wait for formation of National Energy Board proposed in the controversial Borden report.

▼ ▼ ▼

Engineering is losing its attraction to youth.

New study of 1958 college enrolment shows:

...Total enrolment at all-time high, up 4.1% over 1957.

...Number of full-time freshmen rose 7.1%.

...Engineering freshmen showed a 7.6% decrease, the only freshman category to decline.

With tragic fires in the spotlight, oil and gas men should know:

Less than 3% of U. S. building fires last year were attributed to gas and gas appliances.

Nation's building fires totaled 843,000 for loss of $1,068 million. Gas caused only 22,800 at loss of $28.6 million.

▼ ▼ ▼

A staggering long-range forecast for oil has been made by Chase Manhattan Bank (p. 74). The outlook:

...Total free-world demand will be 29,500,000 bbl. daily by 1967.

...Domestic demand will reach 14,400,000 bbl. daily.

...Drilling needed in 10 years will be 670,000 wells and 3 billion feet of hole.

...Capital expenditures of $140 billion will be required.

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of Christmas

be with you today

and throughout the New Year

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TULSA, OKLAHOMA

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the OIL AND GAS JOURNAL

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TECHNOLOGY—OPERATION

Drilling-Production

SPECIAL SECTION—CHEMICALS IN DRILLING MUD 90

By Dr. George R. Gray

Here's a look at why, where, and when they're added, and a survey of some figures on cost. Total expenditures for materials used in drilling fluids approached $150,000,000 in 1957. The mud program becomes increasingly significant as wells are drilled deeper, and the composition of the drilling mud becomes more critical.

Major topics of discussion include: (1) Why drilling fluids are used; (2) composition of drilling fluids; (3) clays; (4) lost-circulation materials; (5) dispersing agents; (6) chemicals to counteract contaminants; (7) products for special application; (8) oil-base drilling fluids; and (9) future application for chemicals.

Watch Those Log Readings When Oil or Gas Is Present 102

By J. K. Kerver and C. L. Prokop

Sands appear more shaly on the potential curve with oil or gas present. The SP reading may be altered to the point that some quantitative interpretations may be affected. High hydrocarbon saturation and low water salinities make readings even lower. Readings should be especially watched in sands having small pore channels.

LACT Unit Installed on Tuesday, Runs Oil on Wednesday 113

The skid-mounted meter-type unit was unloaded at the Fairfax Water-flood in Osage County, Oklahoma, at 9:30 one morning and 100 bbl. of oil had been handled by 4:30 the next afternoon.

Pipelining

Here's Northern Natural's Outlook for Gas-Transmission Systems 99

By A. L. Vaughan

Northern Natural Gas Co. now has five fully automatic stations which are push-button-controlled—that is, fully automatic. The company has 10 other stations wherein newly installed engines are automatically controlled, and plans are to make fully automatic all new compressor stations.

Interface Detectors Have Made Progress But Are Not Perfect 119

By R. R. Hancox

Great Lakes Pipe Line Co. has worked with interface detectors for more than 5 years. The company has found it relatively easy to detect interfaces of: (1) fuel oil-fuel oil, and (2) gasoline-fuel oil. The difficult problem is detection of gasoline-gasoline interfaces.

Refining-Processing

Process Costimating 108

Cost of operating vacuum flash units can be estimated with ease except for the steam consumption and the water required to condense the steam.

Ammonia Supply and Demand . . . In Balance by 1961? 109

By Jack Melnick

That's the prospect, according to a recent careful analysis of the U. S. nitrogen market. This is qualified by the provision that there be no further increase in ammonia capacity beyond that now contemplated. Consumption should equal 4,176,000 tons by 1961.

The Foreman's Page 114

Properties of stocks should be considered when selecting materials of construction for process units.

Do-It-Yourself Ideas Cut Refinery Upkeep . . 117

By Larry Resen

Here are 11 short-cut methods which simplify mechanical-department jobs at Continental Oil Co.'s Lake Charles, La., refinery. They range from simple to complex and each improves efficiency.

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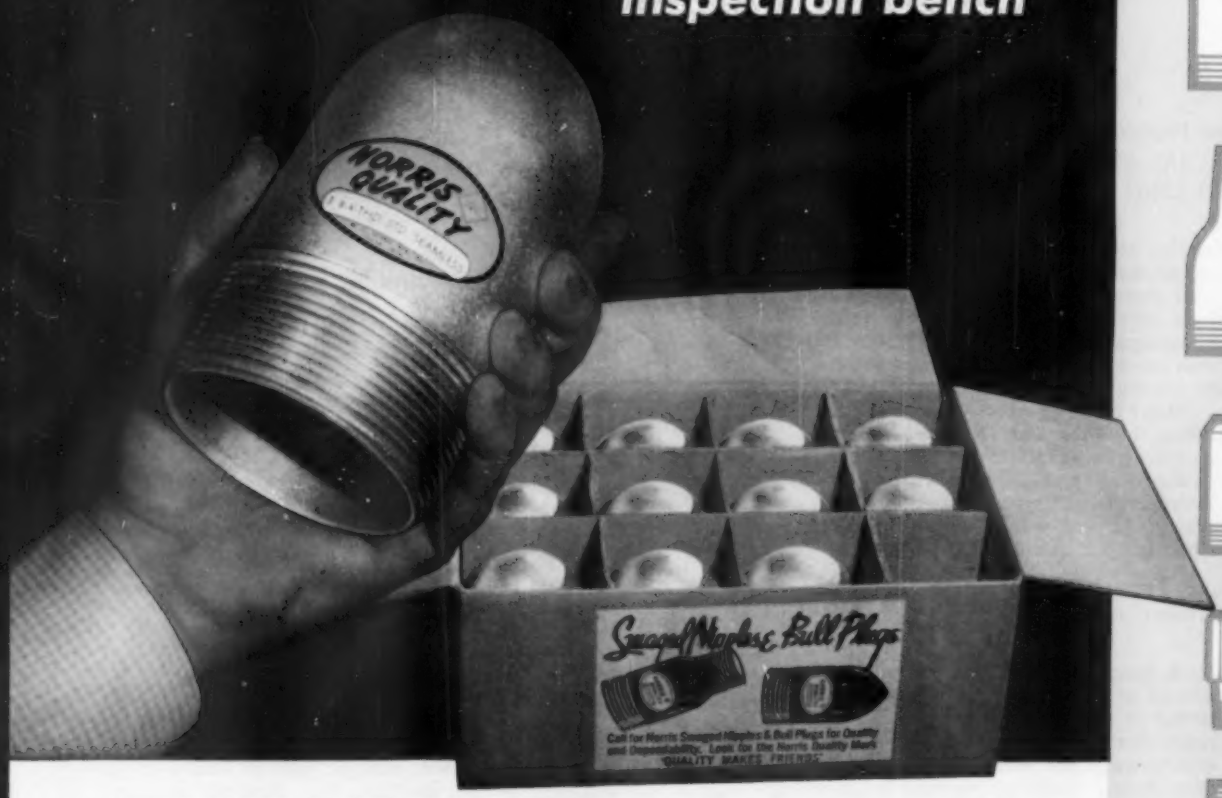

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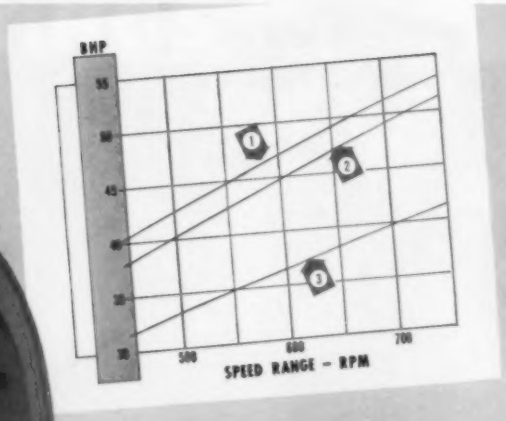

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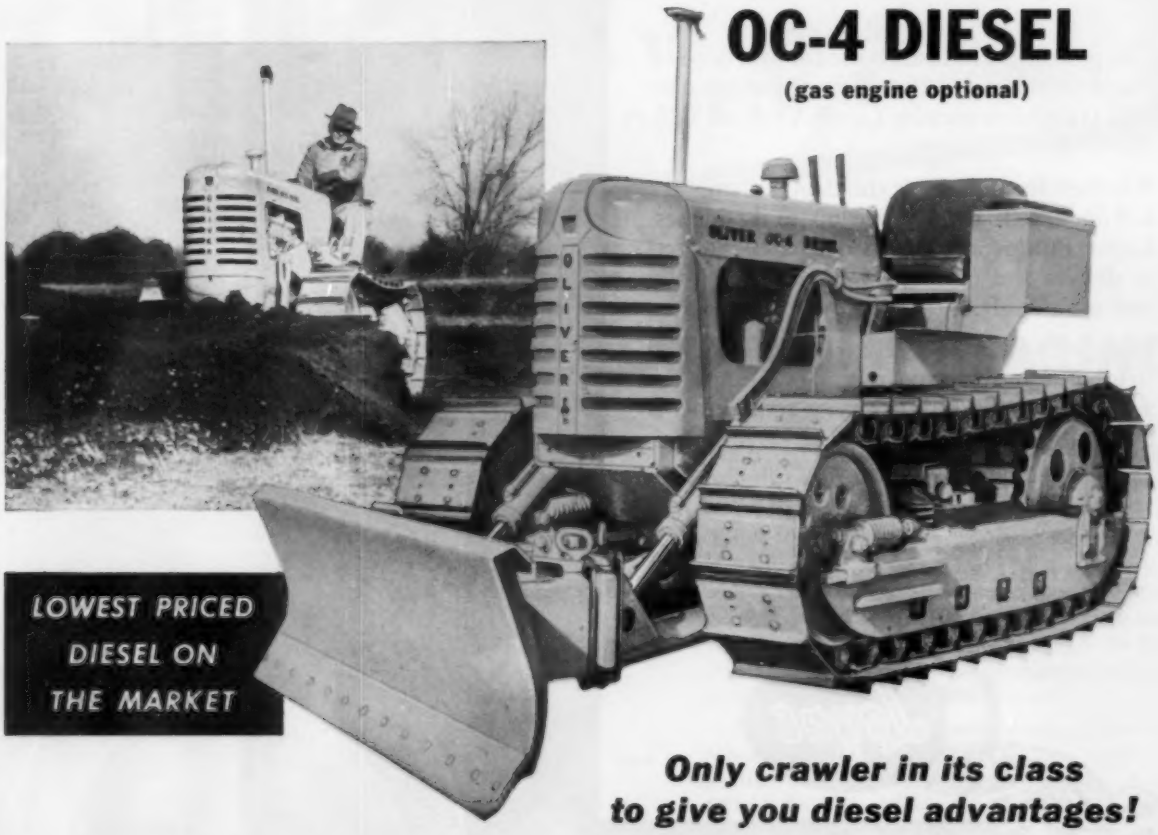

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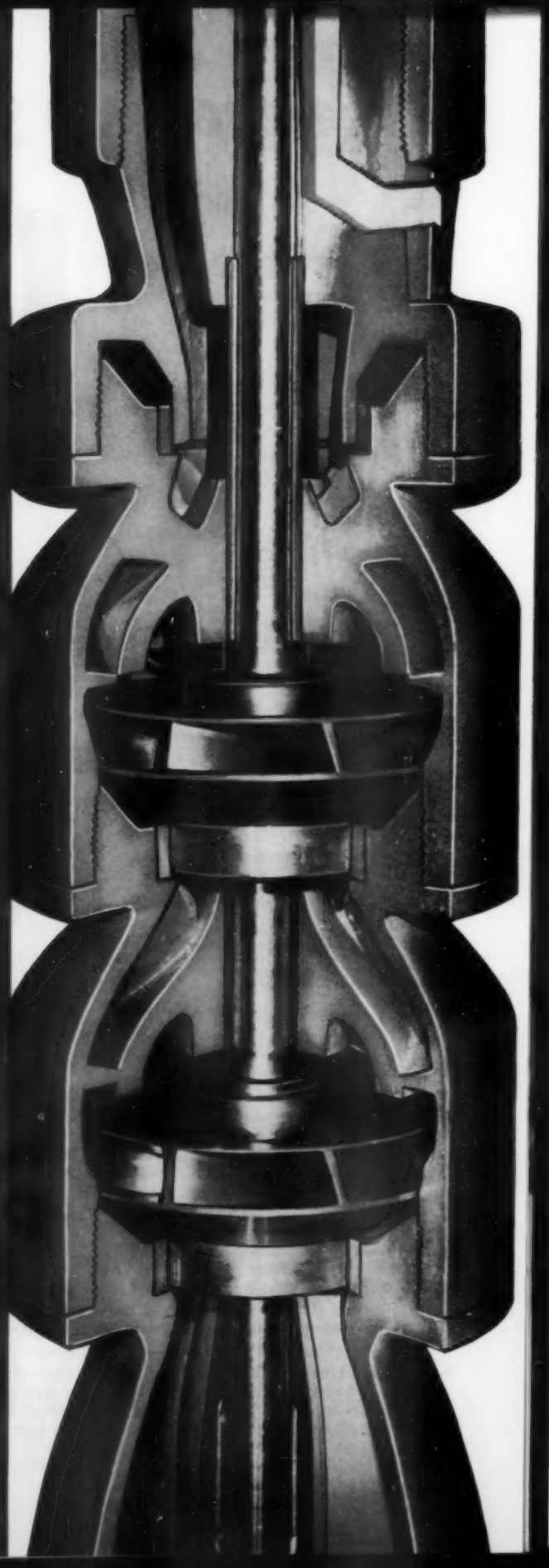

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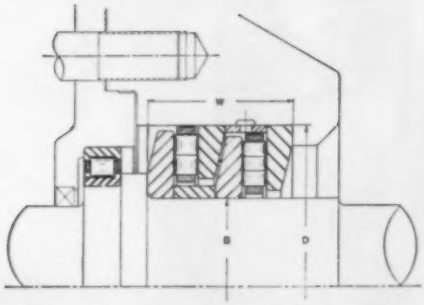

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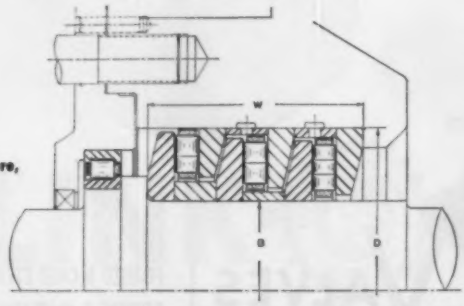

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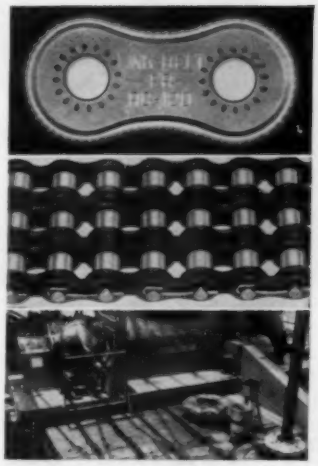
FR*

ROLLER CHAIN

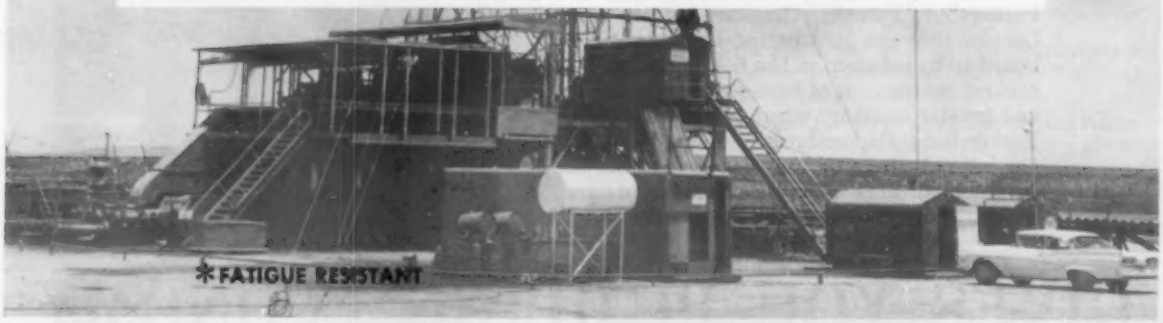
WHEN a National 130 rig pushes past 25,000 feet, it's a cinch no ordinary chain drives can withstand the brutal punishment encountered. No surprise then that this record smashing Phillips Petroleum Rig #27 uses Link-Belt Fatigue Resistant Roller Chain throughout. Twelve-hour round trips . . . hard formations that slowed down drilling to two feet an hour — this chain licked every challenge.

FR is Link-Belt's patented (U.S. No. 2,517,497) process for compressing the metal around roller chain pitch holes . . . the critical areas most vulnerable to fatigue failure. The result: a tremendous increase in *dynamic strength*. And the sort of performance demonstrated at this Phillips Petroleum Co. well.

Catalog 2880 has more facts on FR and all Link-Belt oil field equipment. You can get a copy at any leading supply store.



DRAWWORKS on Phillips' record University "EE" Well No. 1 uses multiple-width Link-Belt Roller Chain (center) with FR-processed sidebars (top).



*FATIGUE RESISTANT

LINK-BELT

ROLLER CHAINS AND SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 26, Odessa, Tex., New Orleans 16, Shreveport, La., Los Angeles 22 (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 14,000

PARKERSBURG QUALITY

Brinell hardness of pinion forging is determined by inspector, one of many controls that make Parkersburg units outstanding.

Diameter of main gear is checked with bow mikes in the Parkersburg plant. Parkersburg quality begins in the plant.

that begins on the production line

Parkersburg Pumping Units are better because they are *built* better. From drawing board to installation in the field, quality control assures you of better performance and greater economy when you specify Parkersburg. Parkersburg Pumping Units do the job right because they are *built* right. In any field, Parkersburg Pumping Units are outstanding. They are always your best buy.

GIVES YOU PUMPING ECONOMY IN THE FIELD

THE PARKERSBURG RIG & REEL COMPANY
Division of Parkersburg-Aetna Corp.

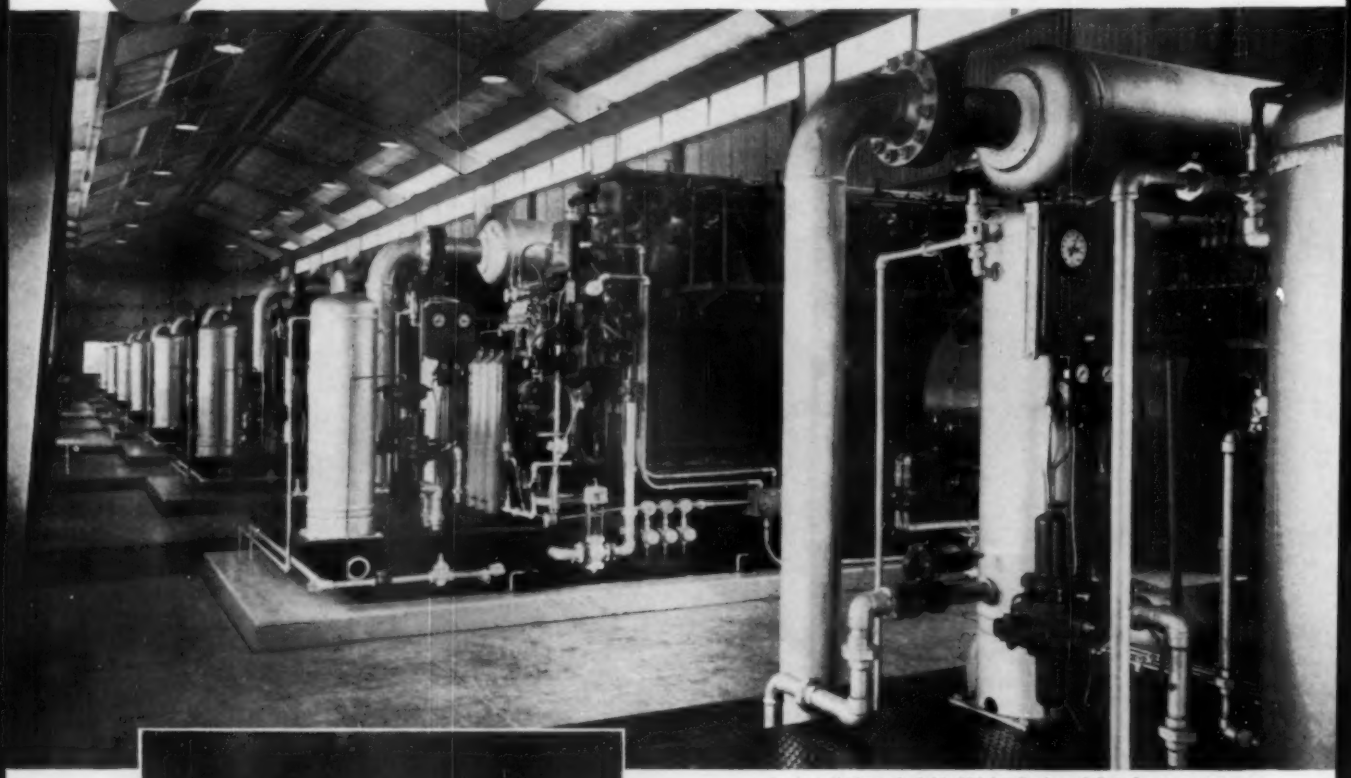
THE PARKERSBURG RIG AND REEL CO.

Pumping Unit Division Offices:
710 Mid-Continent Building, Tulsa, Okla.

Parkersburg Pumping Units are available through the following supply stores: Beacon Supply Co., Bovaird Supply Co., Canadian Equipment Sales & Service Co., Ltd., C. W. Cotton Supply Co., Franklin Supply Co., Franklin Supply Co., Ltd., Houston Oil Field Material Co., Inc., Industrial Supply Co., Iverson Supply Co., Midland Supply Co., Inc., Mountain Iron & Supply Co., Murray-Brooks, Inc., Oil Equipment, Ltd., Producers Supply & Tool Co., Rodman Supply Co., Superior Iron Works & Supply Co., United Supply & Manufacturing Co., Wilson Supply Co.

Southwest

300 MILLION CUBIC FEET PER DAY WITH SOUTHWEST PACKAGED GAS COMPRESSORS



—An installation of eight 660 hp Packaged Gas Compressors at Southern Natural Gas Company's Franklinton, Louisiana, compressor station handling 300 MMCF/D.

—All units in this Southern Natural plant are automatically controlled from start up through loading, unloading, and stopping by this central control station.

Rugged, heavy-duty Southwest Packaged Gas Compressors have proved themselves in main line pumping. This installation of eight 660 hp Southwest Packaged Compressors is in main line booster service at the juncture of Southern Natural's south and west Louisiana pipelines.

Whatever the application, packaged compressor plants can be in operation months before field assembled units can be built and at a lower cost.

The same advantages of economy, speed, installation, and ease of operation can be yours, too. Southwest can package all leading gas compressors. You name the type compressor; Southwest designs, engineers, and packages the compressors to meet your particular needs. Southwest Packaged Plants totalling more than 100,000 horsepower are working now in the field.

SOUTHWEST INDUSTRIES, INC.

P. O. Box 19392, Houston 24, Texas

Designers and manufacturers of Packaged Inert Gas Generators, Packaged CO_2 Removal Units, Packaged Gas Compressors.

A TURN FOR THE BETTER IN VALVE DESIGN

The rotating seat shown here is making valve history. It's the central feature of the new Cameron Gate Valve. Each time the valve is operated two of these rotating seats turn up new sealing surfaces and a beautiful new profit picture.

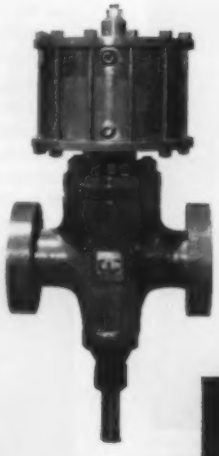
People who use valves and the people who specify them are taking a sharper look at the costs after purchase. Let's face it. When you buy a valve for drilling, production or processing service—what are you buying? Actually you are purchasing operating cycles—but how many, for how much?

To determine this may be easier than you think. Valve prices are not too divergent. All acceptable valves will hold pressure and release it when new. Right here, however, radical differences take place. Once in the line what does it cost to keep a valve working efficiently? Some valves require a continuous lubrication program, which immediately increases the cycle cost. Some valves must be removed from the line and taken to a shop when major repairs are necessary. Many are slow and hard to operate, adding man-hours to the cycle cost.

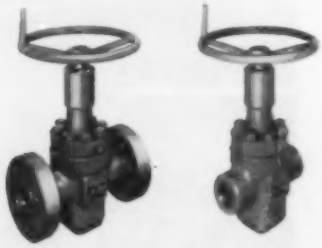
If the valves you are about to purchase have any of these disadvantages, CALL ON CAMERON. We have good news for you. Our new gate valve for water, oil, gas, and mud is making friends and saving money because it costs far less per operating cycle than any valve on the market. The reason is simple, the Cameron Gate Valve with its rotating seats spreads wear over the entire sealing area rather than concentrating it on one spot. All other valves concentrate wear in one area every time they operate.

If you want the most operating cycles without maintenance — the lowest cost per cycle during the entire life of the valve, take a turn for the better, take Cameron Gate Valves.

Longest maintenance-free operation of any valve on the market today.



Easy, in line repair with this simplified gate "package."



A full range of sizes and pressure ratings is available including hydraulically and air operated valves for remote controls and automated circuits.

Cameron

IRON WORKS, INC.

P. O. Box 1212 - Houston, Texas

Export Office: 7912 Empire State Bldg., New York City. In England: Cameron Iron Works Ltd., 76 Grosvenor St., London W. 1 England.

Lower Battery Drain—No need now for heavy duty batteries and generators. Current drain on "stand-by" is 1/3 that of tube-type receivers, 1/15 with battery saver switch.

Greater Reliability—Transistors, printed circuits and new design all greatly increase reliability.

Smaller, Lighter—Approximately 1/2 the weight, 1/3 the size of other models. Mounting in tight quarters easier than ever.

Completely transistorized receiver and power supply... Another Motorola First!

Here is 2-way radio with efficiency and reliability never before approached in mobile radio. No more tubes in the receiver —no more vibrators in the power supply . . . all are replaced by long life, dependable transistors. No longer is it necessary to idle the vehicle to keep the radio operating. Savings in gasoline, engine wear and batteries add up fast. Let us prove to you how MOTRAC radio will cut your radio operating costs . . . while giving you reliability never before possible. Write today.

MOTOROLA 2-WAY RADIO

Motorola Communications & Electronics, Inc., 4501 Augusta Blvd., Chicago 51, Ill. • A Subsidiary of Motorola Inc.

MOTRAC is a trademark of Motorola Inc.

FOR SPECIAL CONDITIONS...

HALLIBURTON SPECIAL TOOLS!

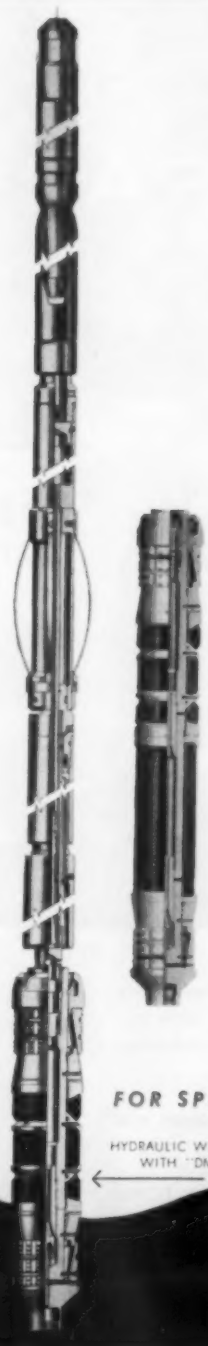
A size and a type..."patterned" particularly to your needs—for better production improvement among many other benefits... is available with Halliburton Special Tool Services.

The selection and placement of Special Tools is determined by a skilled Halliburton operator who knows their design and purpose, and the operation of tools selected for your well problem.

For Special Problems, Such As...

- Squeeze Cementing
- Formation Fracturing
- Chemical Treating Under Pressure
- Lost Circulation
- Casing Leaks

Halliburton has Special Tools designed for you... bringing you the advantage of better and more successful operation, whenever they are used.



HYDRAULIC WIRE LINE SETTING TOOL WITH "DM-DC" BRIDGE PLUG

HYDRAULIC WIRE LINE SETTING TOOL

A dependable and highly accurate setting tool that saves time and cost in setting Packers and Plugs... also reduces special footage and set-up charges. May be used in wells with or without fluid, as the hydraulic fluid necessary to operate it is carried in the tool. Only requires a light duty wire line or cable to set packer even with a 30,000 lb. tension sleeve... a few short up and down movements of the line on which setting tool is run operates a hydraulic pump inside supplying the required setting force. Available for use with Halliburton "DM-DC" Bridge Plugs, "DM-DC" Squeeze Packers, Wire Line Bridge Plugs and "CL" Production Packers.

OPEN HOLE DRILLABLE SQUEEZE PACKER

Used extensively in open hole formations that are near to true bit size. Identical to "DM-DC" Squeeze Packer except for addition of extension mandrel and a long rubber seal element. Setting same as regular squeeze packer, except, cannot be set on any type wire line Setting Tool.

HALLIBURTON TOOLS... MOST ADVANCED FOR SPECIAL PURPOSES

HALLIBURTON

SPECIAL TOOL SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

"Continue to look to HALLIBURTON for the BEST in SPECIAL TOOLS"

HALLIBURTON "DM-DC" DRILLABLE SQUEEZE PACKER

Designed to provide positive fluid shut-off from either direction . . . regardless of depth or pressure. Forms an effective plug for squeezing cement or placing chemicals below packer at selected point behind casing or liner, around shoe or shoe joint . . . Easy to set on drill pipe, tubing, drilling or sand line or with electric wire line Powder Type Setting Tool. Outstanding operational features include simplified setting procedure . . . positive mechanical action of rotating tubing to the right . . . freedom of Tubing and Circulating Valve from packer before squeeze begins. After packer is set, can become a Bridge Plug, when Sealing Plug or Ball is dropped or pumped in place.

HALLIBURTON DRILLABLE TYPE "C" PRODUCTION PACKER

Adaptable for single or dual zone well completions . . . is full opening and highly adaptable for fracturing work . . . when set in casing on tubing, well can be treated . . . perforated . . . and squeezed below if desirable before well is placed on production . . . *all in one trip* saving you time and money.

HALLIBURTON "RTTS" PACKER

The Retrievable Test-Treat-Squeeze Packer is the industry's most efficient multi-purpose tool; designed for testing, treating and squeezing operations. Permits combination high pressure treating and squeezing applications *with only one trip into the hole.* Equipped with full-opening fluid passage and incorporates circulating valve and safety joint.

HALLIBURTON "HM" RETRIEVABLE PACKER

A hook wall type packer run on tubing in a cased hole to provide a seal above the section to be fractured, acidized or tested for production. Allows large volumes of fluid to be pumped through tool with minimum pressure drop. Set by weight of tubing; released by picking up . . . hydraulic slips prevent movement of packer up the hole . . . can be set and reset for multiple treatments as many times as desired without coming out of the hole.

TYPE "C" PRODUCTION PACKER

"HM" RETRIEVABLE PACKER

"DM-DC" DRILLABLE SQUEEZE PACKER

"RTTS" PACKER

"I can give you 24 good reasons why this UNIBOLT Christmas Tree Flow Manifold is your best buy"

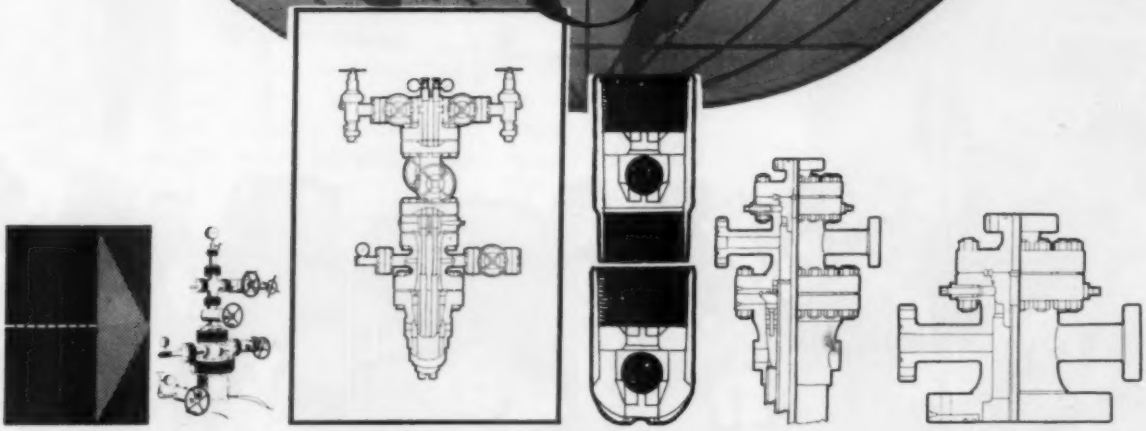
Pound for pound, dollar for dollar, or by any other standard of comparison, UNIBOLT gives you more for your money than any other production manifold or flow control unit.

In addition to numerous mechanical refinements, many of which are exclusive, the UNIBOLT Flow Manifold permits the operator to select the manifold *best suited for his particular well requirements.* Unlike manifolds of fixed design, with UNIBOLT you buy only what you need and nothing more. Using three standard UNIBOLT products—Tee (or Cross for double wing trees), Adjustable Wing Valve, and Positive Choke Body or Cage Nipple and Bean—you have the choice of several combinations. Greater flexibility in arrangement of flow manifolds, complete salvage of parts for use elsewhere, either separately or as a unit, easy field maintenance—these economies and conveniences are yours exclusively with UNIBOLT.

Any UNIBOLT representative will gladly show you all twenty-four reasons why this production manifold is your best buy.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS

RECTOR EQUIPMENT covers the globe



Regardless of where in the world you drill, Rector wellhead and cementing equipment and Rectorseal are available. Through the world-wide export facilities of Continental-Emsco Co., Mid-Continent Supply Co., and Oil Well Supply Division of United States Steel Corp., you can be assured of the *safety* and the dependability of Rectorheads, RectorTrees, Rector Cementing Equipment, and Rectorseal. No other manufacturer of wellhead and cementing equipment can offer as extensive export service as Rector through these three organizations.

So, at home or outside the United States, the best buy in wellhead and cementing equipment is Rector. Rector is the *safest* buy, too.

RECTOR EQUIPMENT IS AVAILABLE THROUGH THESE EXPORT REPRESENTATIVES:

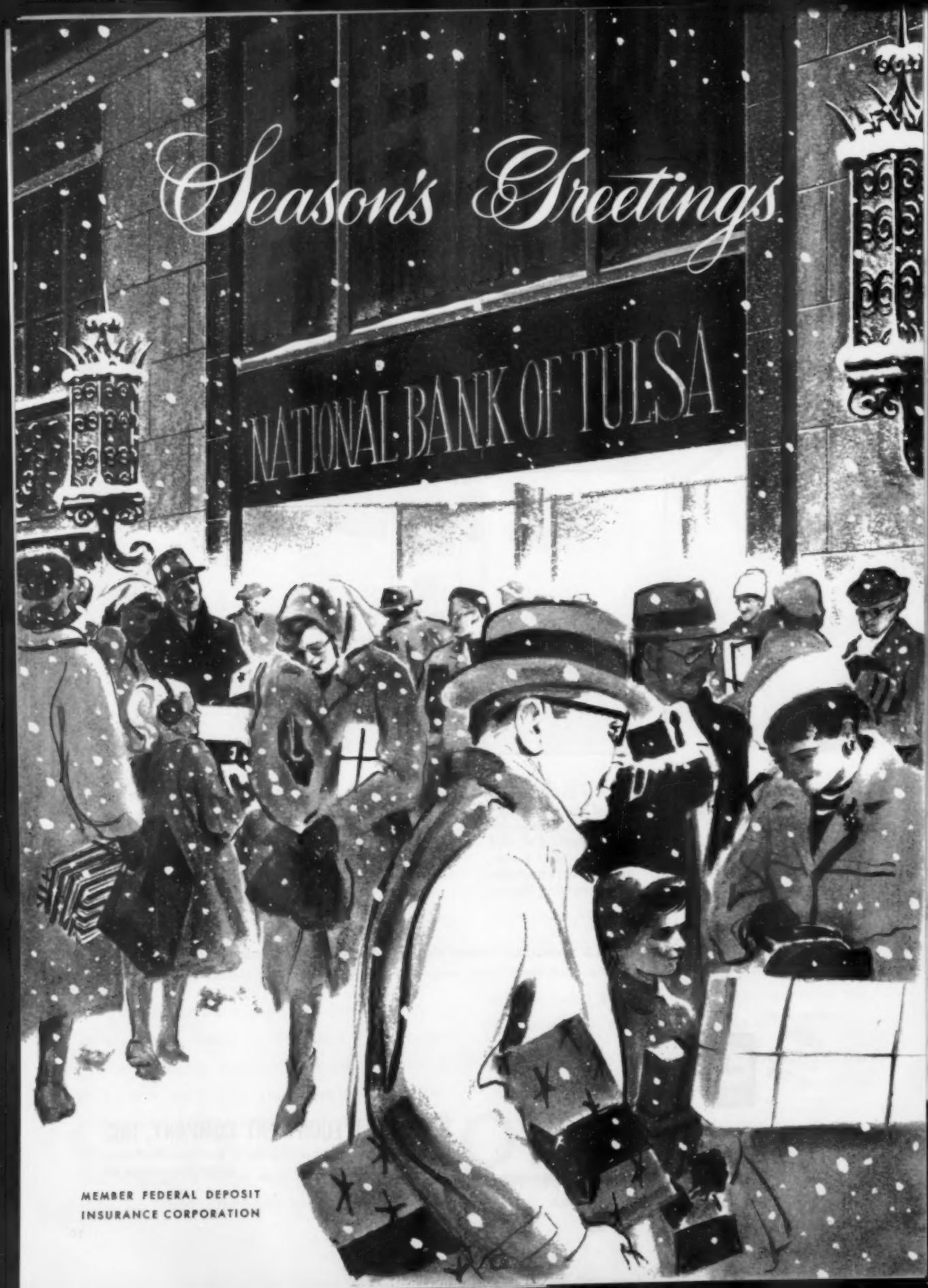
CONTINENTAL-EMSCO CO. • MID-CONTINENT SUPPLY CO. • OIL WELL SUPPLY DIVISION of United States Steel Corp

SEE OUR EXHIBIT

MAY 16-23, 1959
Tulsa, Oklahoma

RECTOR WELL EQUIPMENT COMPANY, INC.

1100 North Commerce • Fort Worth, Texas
Houston Plant: 2215 Commerce St.



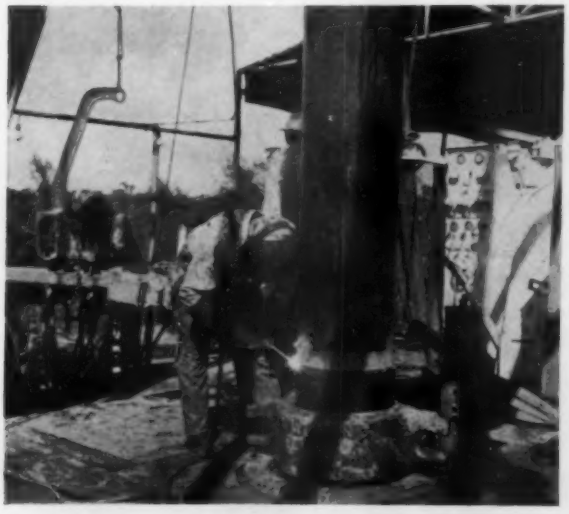
MEMBER FEDERAL DEPOSIT
INSURANCE CORPORATION

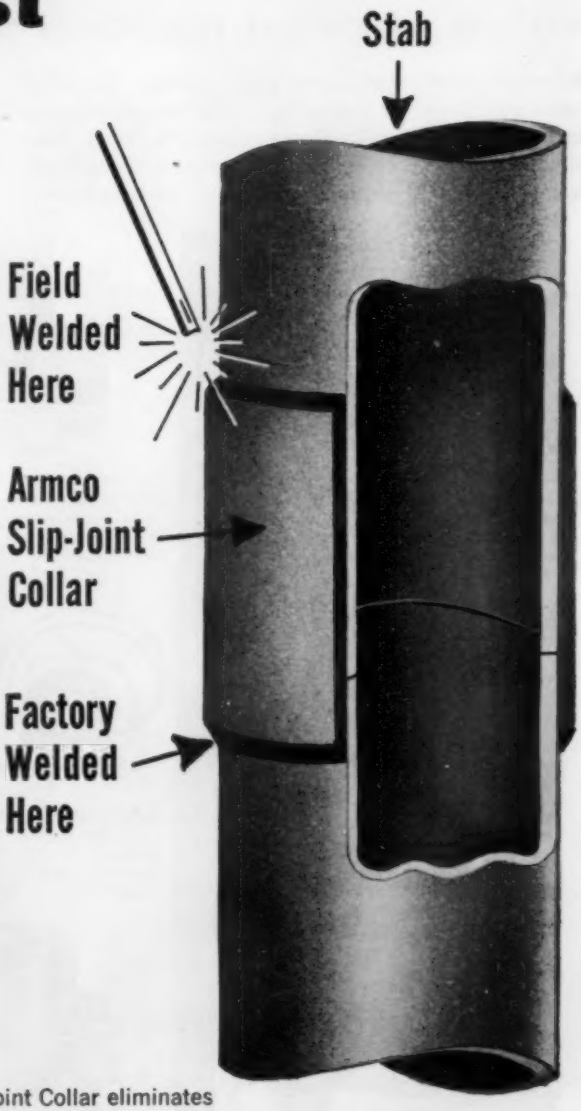
Here's Why Armco Casing goes in fast

The Armco Slip-Joint Collar makes it easy for you to reduce running time and costs. Just stab the end of the next joint into the collar, make a quick weld, and lower away.

Armco Casing comes in long, 40-foot lengths. This means fewer joints, less welding time. You can select from a wide variety of diameters (6 to 24 inches) and wall thicknesses (.188- to .500-inch).

Write for complete data on Armco Casing. Armco Drainage & Metal Products, Inc., 5688 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.





The Armco Slip-Joint Collar eliminates line-up problems, speeds welding.

ARMCO SLIP-JOINT CASING

Distributed by National Tank Company, Tulsa, Oklahoma. In Canada: National Tank Company, Ltd., Edmonton, Alberta

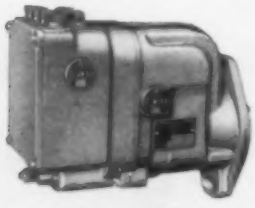
National Tank Company Stocking Points for Armco Casing: Williston, North Dakota; Sidney, Nebraska; Brush, Colorado; Great Bend, Kansas; Liberal, Kansas; Oklahoma City, Oklahoma; Seminole, Oklahoma; Farmington, New Mexico; Hobbs, New Mexico; Pampa, Texas; Lubbock, Texas; Snyder, Texas; Abilene, Texas; Odessa, Texas; Houston, Texas; Shreveport, Louisiana; Lake Charles, Louisiana; New Iberia, Louisiana; Harvey, Louisiana; Clay City, Illinois; New Harmony, Indiana

ARMCO®

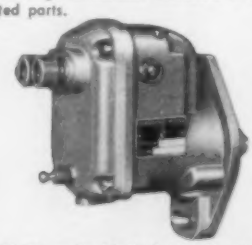
952

different sizes, shapes, and types of Fairbanks-Morse "SUPER-SPARK" Magnetos solve special ignition problems like these . . .

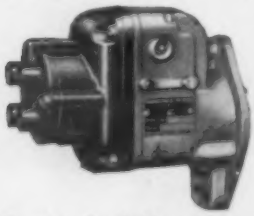
A better solution at lower cost — that's what you can count on when you bring special magneto problems to the Fairbanks-Morse engineers. They meet almost any need with existing components selected from nearly a thousand magnetos . . . keep manufacturing costs low, give you improved product performance with a Fairbanks-Morse Super-Spark Magneto precisely tailored to fit your equipment and operating conditions. Units shown below typify the range of F-M stock magnetos.



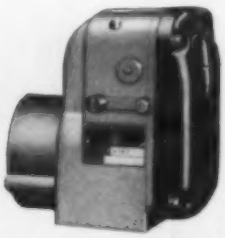
FM-E6—radio-shielded, designed for continuous heavy duty. Vented frames, CW or CCW rotation, base or flange mounting. For 4- or 6-cylinder engines. 180 deg spark interval, feed through condenser. Standard or fungus-treated parts.



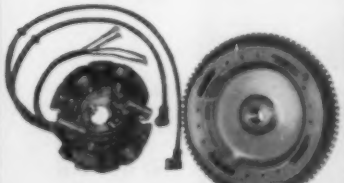
FM-PE1-2B—radio-shielded, 2-spark. Magnetic rotor, ball-bearing drive end, roller-bearing cam end. Single impulse coupling pawl, intense spark during starting, automatically retarded. 360 deg spark interval. Fungus-treated or standard parts.



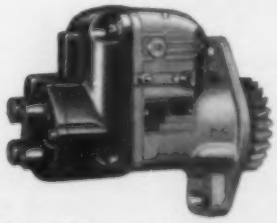
FM-X4B—outstanding ignition unit for tractor and industrial engines. Highly adaptable mounting, applicable to wide range of medium- to heavy-duty engines. CW or CCW rotation, 180 deg spark interval. Sealed or vented frame.



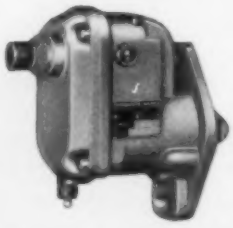
FM-X1A—base-mounted, available with 35 mm or 45 mm base plates. CW or CCW rotation, alnico magnetic rotor. Fungus-treated or standard parts, sealed or vented frame. Multiple applications.



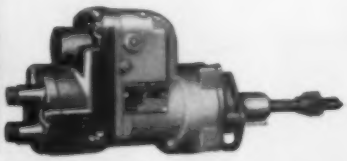
FM-WG2P87—9-inch flywheel magneto-generator. CW rotation, 180 deg spark interval. Designed to give dependable service on 2-cylinder engines. Charging unit delivers 5-amp charge to 12-volt system.



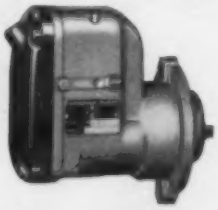
FM-ZV4B—4-pole rotor and 4-lobe cam produce ignition spark every 90 deg. Standard or special arrangement for extended drive shaft. CW rotation. Radio-shielded units available.



FM-PE1B—newly designed for high-speed single cylinder engines. Ball bearings on rotor drive end, roller bearings on rotor cam end. Simplified breaker point system. Radio shielded. 360 deg firing interval. Sealed or vented units, CW or CCW rotation.



FM-ZV4C—special vertical mounting. Impulse coupling gives retarded starting spark without backfire. CW or CCW rotation. Sealed or vented frames, 90 deg spark interval. Radio shielding available. For automotive type distributor.



FM-X1B—flange-mounted. Alnico magnetic rotor, CW or CCW rotation, 360 deg spark interval. Rugged dust- and moistureproof frame, vented or sealed to meet requirements. SAE flange or special flanges available for multiple applications.

Fairbanks-Morse MAGNETOS SALES SERVICE

◀ SIGN OF SERVICE

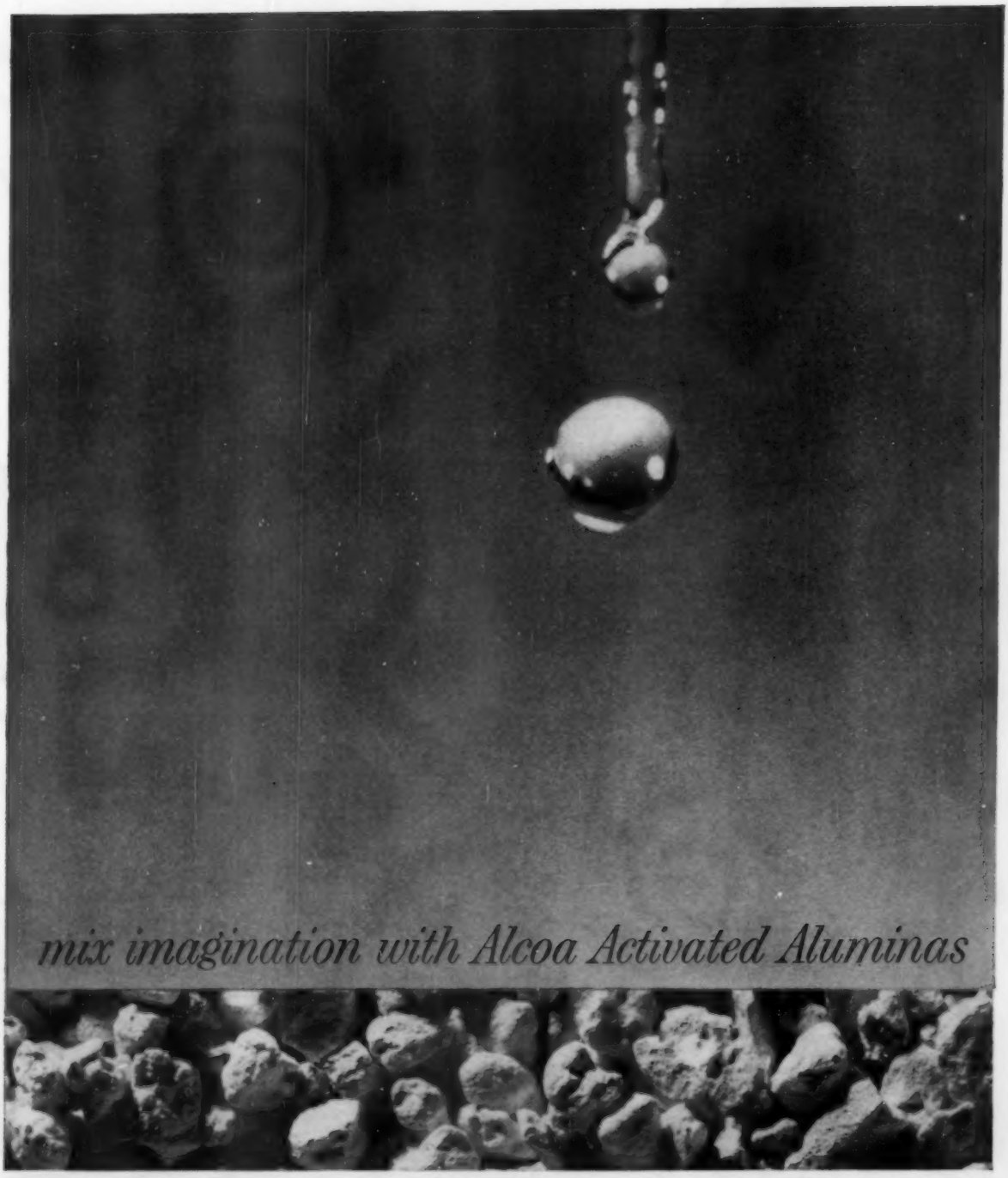
More than 2500 authorized service stations in America handle repairs, replacements, and parts-off-the-shelf for more than 4,500,000 Super-Spark Magnetos now in use!

Write: Fairbanks-Morse, Magneto Div., Beloit, Wisc.

FAIRBANKS-MORSE

A name worth remembering when you want the BEST

MAGNETOS • REWIND AND ELECTRIC STARTERS • WATER SYSTEMS • GENERATING SETS • PUMPS • MOTORS • SCALES • DIESEL LOCOMOTIVES AND ENGINES



to remove the last drop of unwanted product or process water. Is unwanted water undermining your product quality . . . or ruining the efficiency of your process? If so, try this sure solution to your dehydration problems: mix imagination and engineering with Alcoa® Activated Alumina. You can count on this old reliable among commercial desiccants to achieve the lowest dew points you require. It can never soften, swell or disintegrate. It is nontoxic, noncorrosive and practically iron-free. It can be saturated and reactivated through almost endless cycles—to keep drying costs low. Put the proved effectiveness of Alcoa Activated Alumina to work in solving *your* dehydration problems. Drying machines charged with Alcoa Activated Aluminas are available from a number of manufacturers. For their names, or for product information, contact your local Alcoa sales office. Or write ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 715-M Alcoa Building, Pittsburgh 19, Pa.

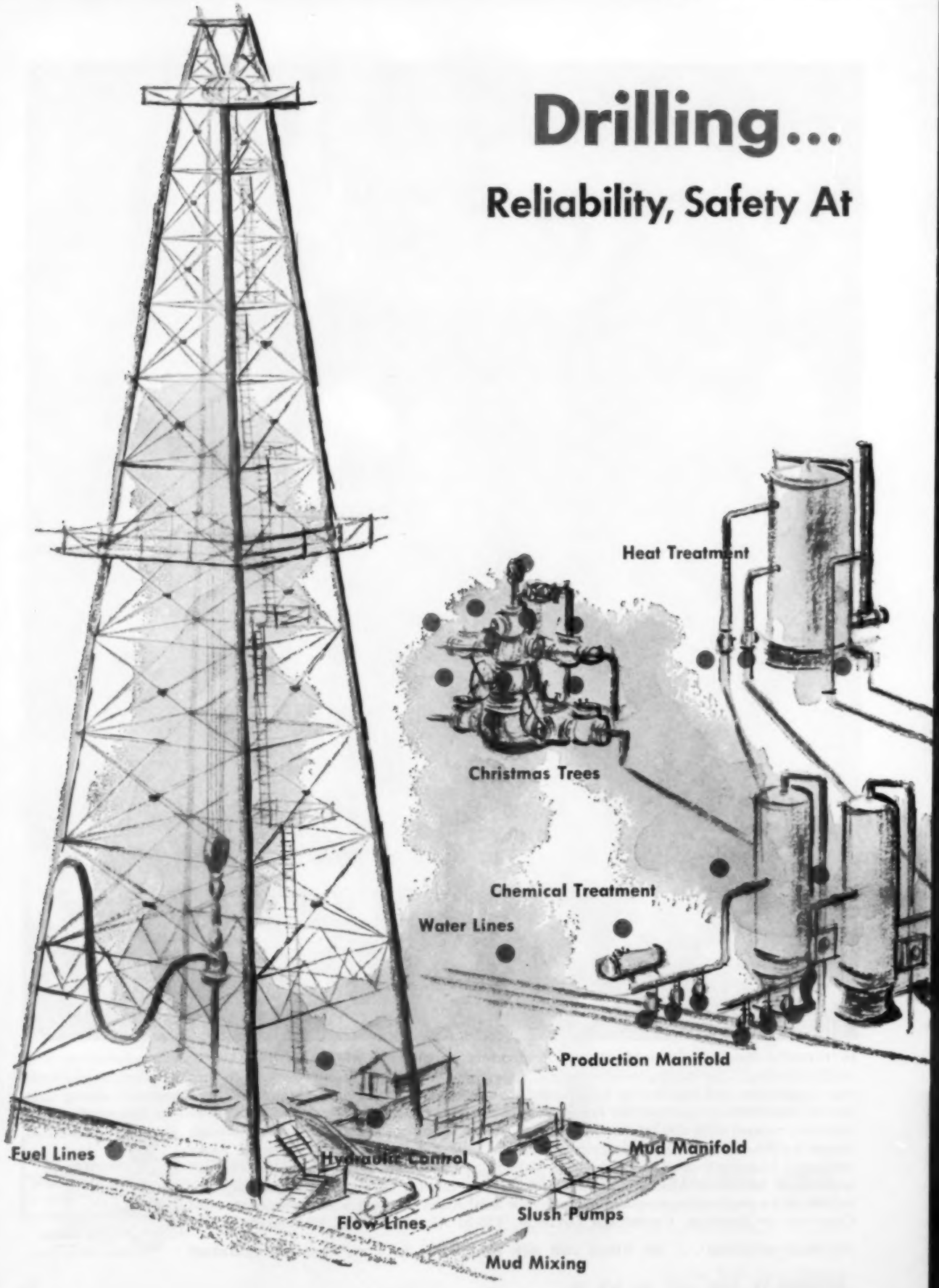
For finer products . . . let Alcoa add new dimension to your creative thinking!

ALCOA CHEMICALS

ALCOA THEATRE
Fine Entertainment
ALTERNATE MONDAY EVENINGS

Drilling...

Reliability, Safety At



Completion...Production

Every Step With ROCKWELL-Nordstrom VALVES

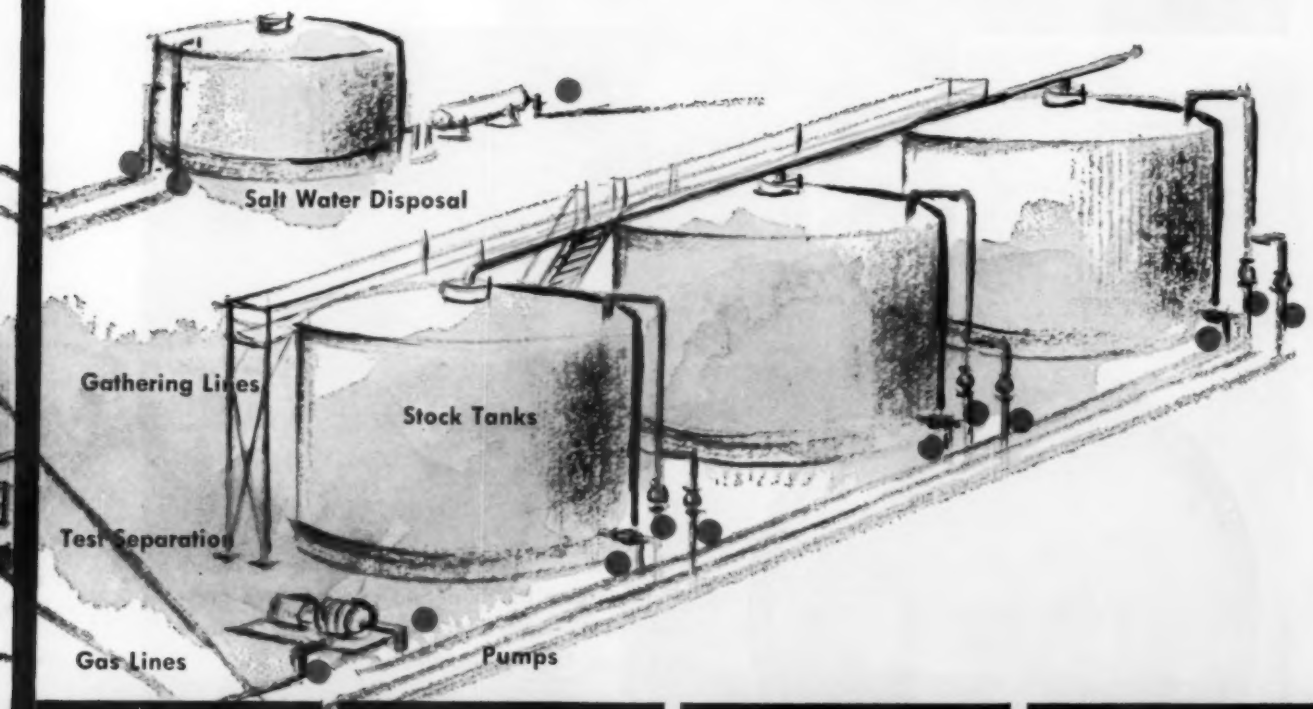
Field men depend on Rockwell-Nordstrom valves for reliable, safe flow control. They know that Rockwell-Nordstrom exclusive Sealdport* lubrication assures leakproof, positive shut-off and instant, quarter-turn operation that can't be had in ordinary valves.

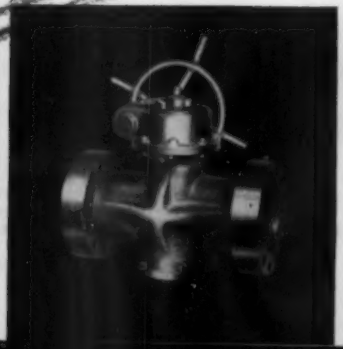
The dependability of Rockwell-Nordstrom valves has been proved by forty years of service throughout the oil and gas industries. They can't be matched from any standpoint, yet they cost no more to buy, often less than ordinary valves. For more information, call your supplier or write: Rockwell Manufacturing Company, Pittsburgh 8, Pa.

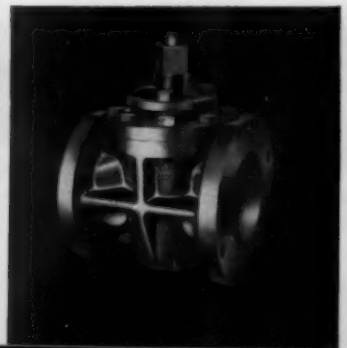
Canadian Valve Licensee: Peacock Brothers Limited.

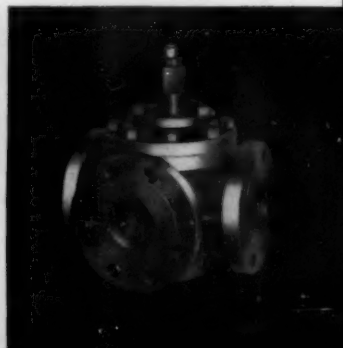
*Registered trademark Rockwell Manufacturing Company

ROCKWELL-Nordstrom VALVES
it's ROCKWELL
MANUFACTURING COMPANY





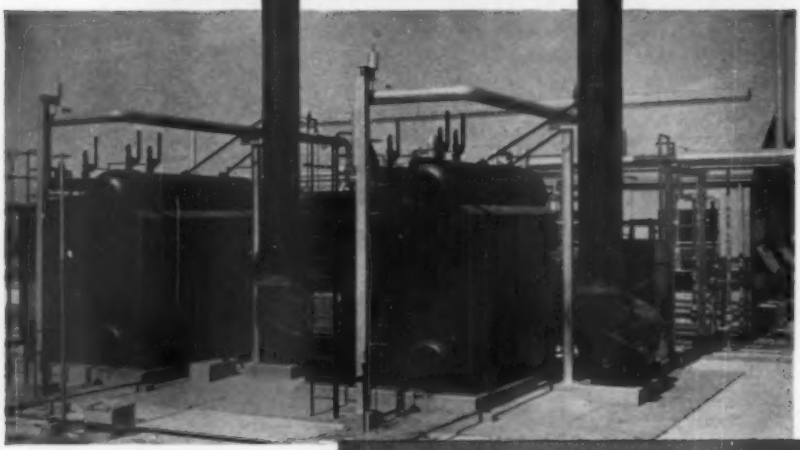


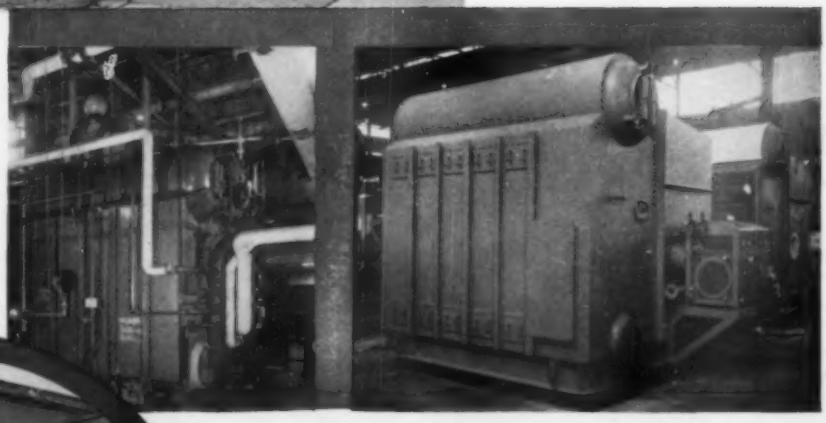


Vogt

Package

STEAM BOILERS *give* versatility with economy

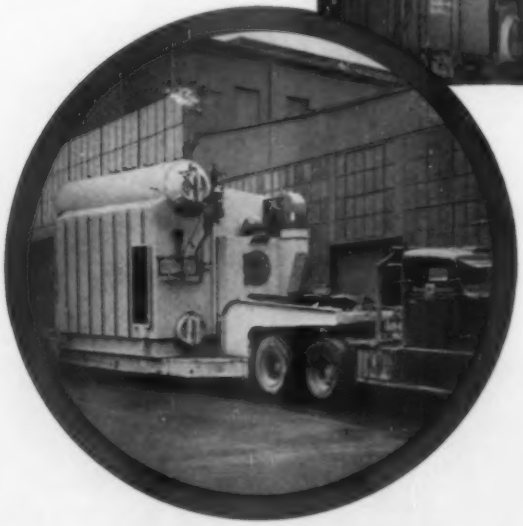




Above: Two units serve a gas pipeline company.

Left: Installation in fibre box-board plant.

Right: Unit for a leading soap manufacturer.



Enroute to an office building.

FOR POWER, PROCESS OR HEATING

Available in capacities from 10,000 to 50,000 pounds steam per hour in three standard pressures of 175, 250 and 375 pounds per square inch gage, factory assembled.

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HENRY VOGT MACHINE COMPANY, Louisville, Ky.

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J., St. Louis, Charleston, W. Va., Cincinnati.

OTHER VOGT PRODUCTS:

DROP FORGED STEEL VALVES, FITTINGS, FLANGES AND UNIONS
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5,400 FT. ROUND TRIP IN 2 HOURS WITH "JIMMY" DIESEL-POWERED "MIGHTY MOLE"

How's this for a record? At 5,400 feet, pulling 4½" pipe in "thribbles," the time required for a round trip by Brown Drilling Company's GM Diesel-powered Rig #7 was only two hours flat, according to E. M. Porter, engine mechanic on the job. "That," says Mr. Porter, "is because of the 'Jimmy' Diesel's fast acceleration under load!"

Fourth of the company's rigs to be equipped with GM Diesel power, it has five "6-110" engines. Brown selected "Jimmy" Diesels because of favorable past experience, and because the low weight and small size per horsepower of these 2-cycle engines contribute to high portability. The entire rig which can drill to 9,000 feet can be moved over the highway in 13 loads. Engines and pumps can be moved intact without teardown—reducing time and cost on moves.

For full information on the application of these engines to your job, call your GM Diesel distributor today—or write us.

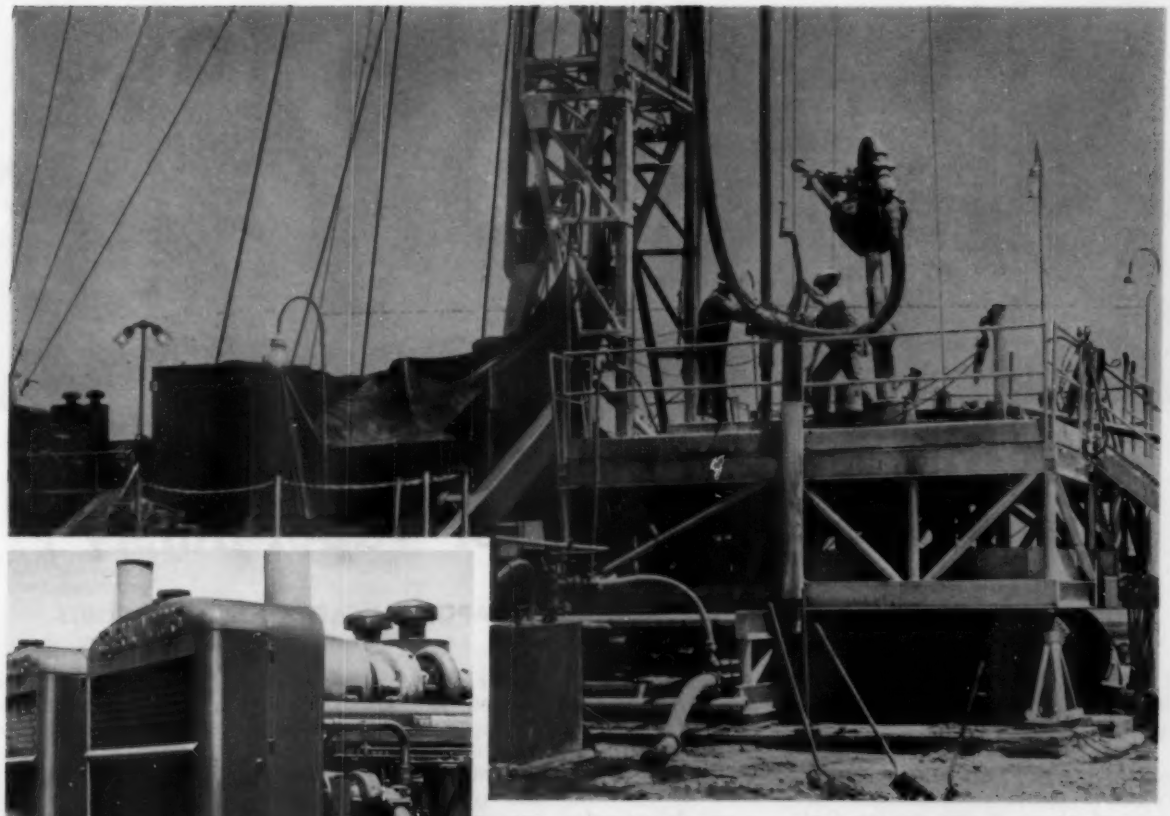
DETROIT DIESEL ENGINE DIVISION OF GENERAL MOTORS, DETROIT 28, MICH.

GM GENERAL MOTORS DETROIT DIESEL POWER

Regional Offices: New York, Atlanta, Detroit, Chicago, Dallas, San Francisco

In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario

Now—more than ever—it pays to standardize on GM Diesel—available in 1600 applications of power equipment built by more than 250 manufacturers.



Rig #7, owned by Brown Drilling Company, Long Beach, Cal., shown drilling near Rio Vista. Five GM "6-110" engines power Emsco #350 draw works, D500 and D300 mud pumps.

Millions of tiny pores like these make Davison Silica Gel "vapor-thirsty"!

THEY STRONGLY ATTRACT CONDENSABLE, VAPORS, HOLD THEM AS LIQUIDS

Is it any wonder that Davison Silica Gel is ideally suited for air and gas dehydration?

One cubic inch of this high capacity adsorbent and desiccant contains pores having a surface area of about 90,000 square feet (roughly the same surface area as the flight decks of two aircraft carriers). Davison Silica Gel can adsorb up to 40% of its weight of moisture at 100% relative humidity. Even when saturated, it remains dry and free flowing.

Davison Silica Gel is specially treated to give optimum resistance to attrition, and promotes rapid dehydration because of its granular shape. High purity (99.70% SiO_2) and chemical inertness contribute to its resistance to fouling.

A variety of particle sizes, densities and adsorptive capacities are available. Each has been developed to meet specific application demands. There is one to suit yours.

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SPECIALIZATION

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The specialist is important to you. The advanced technology he has developed in almost every field is making business more efficient, productive and profitable.

This is especially true in the complex field of workmen's compensation insurance. And the top specialist in this field is Texas Employers' Insurance Association.

For over 44 years we have provided this one kind of business insurance — and only one kind — to employers in Texas. And we have provided it *at cost.*

Your TEIA team of specialists is ready to serve you. Call us today.

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EMPLOYERS INSURANCE BUILDING
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Anti-lock prevents relative rotation between anchor cage and tubing while running

Re-latch threads prevent upper slips from setting until ready.

Long, flexible drag springs allow easy recovery in case of washover.

Special seal protects against fouling from sand or scale.

Internal shoulder creates a differential piston inside rubber to cause a tighter seal.

Full setting force is transmitted to packing element through lower head. No scrubbing action between lower slips and casing wall during setting stroke.

Guiberson permanent completion

TYPE A DRILLABLE PACKER

runs and sets easily, quickly

- ***Built-in safety against premature setting***
- ***Set and produce in ½ tubing trip***
- ***Unequalled rubber seal***

Guiberson Type A Drillable Packer gives you a versatile packer for many uses..single or multiple zone production, acidizing, pressuring operations, water-flooding, testing, corrosion control and many others.

New safety factors against premature setting are provided since the transmitting of drag from tight casing or impact from junk is direct to the tubing string.

The Type A can be set and placed in production with only ½ tubing trip. Spacing problems are easier, especially when run in combination with a multiple zone packer. From rig floor to completion, the Type A runs and sets faster than any other permanent packer.

Guiberson superior quality rubber and special lead-alloy thimbles compress fully for a leak-proof seal. Setting is quick, easy and uncomplicated..may be set by wire line. Available in 5" through 7⅝" sizes for 2" or 2½" tubing with a full line of stingers and accessories. Ask your Guiberson representative for a recommended installation or write for full details.

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Here's the newest development in wire rope—

USS FIBRESEAL

It's TIGER BRAND of course!

This new wire rope was developed to meet the need for longer life in sand lines, swabbing lines, coring lines and cable tool drilling lines. It has a plastic impregnated fiber core which combines the good deterioration resisting properties of a plastic core with the excellent strand supporting characteristics of a fiber core.

The plastic protects the fiber and prevents absorption of acids and other hole fluids. Consequently, the rope retains its structural balance even when used in drilling or swabbing acidized or sour wells.

One of these new Fibreseal ropes was used in cleaning out 23 wells. Twelve of the wells were acidized and very corrosive. After four months of service, the rope was checked for deterioration. The core was found to be in good condition, having resisted all well fluids without trouble. The user was extremely well pleased with the extra service life he obtained, and the behavior of the line has been very satisfactory.

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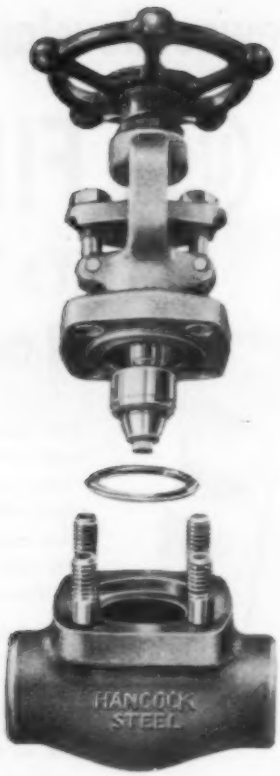

NEW VALVE-OLOGY

shuts off costly maintenance

Hancock 600# Steel Valves incorporate new concepts in valve-ology that reduce valve maintenance and equipment down-time. The forged steel bonnet and body have butting flanges so strong no distortion is possible. The flanges form a bonnet joint that utilizes the sealing power of a Flexitallic* gasket so effectively not even pressures exceeding ten times the rating of the valve can cause a blowout.

Hancock valve-ology makes full use of stainless steel to reduce your valving cost. Seat, disc, stem, swing bolts and nuts, thread bushing, packing gland follower—all are stainless steel. Globe, Angle, "Flocontrol", Lift Check, and Hi-Pressure Drop designs available. A high degree of standardization simplifies servicing and inventory needs. Your industrial supply distributor will gladly give you full details on Hancock Valve quality and performance. Phone him today.

Hancock 600# Steel Globe Valve. Type 5500 Line. Sizes: ¼" thru 2".

*Trademark of Flexitallic Gasket Company

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H2-58

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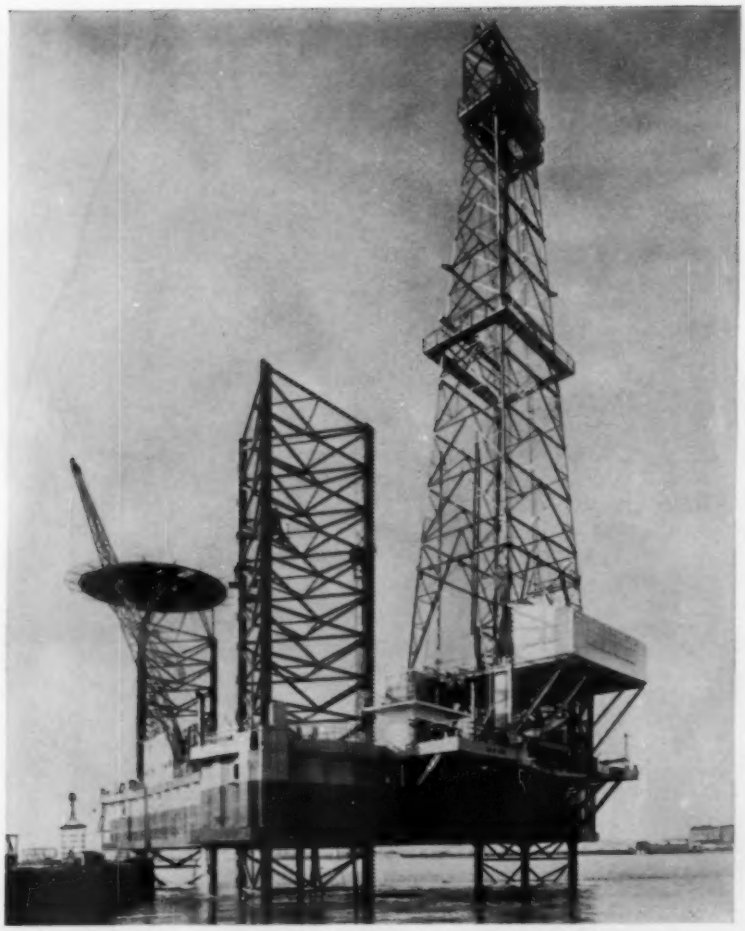


Two of the three 175-ft. legs of mobile tripod-type platform with two-well derrick at right. The legs can be raised or lowered one foot per minute. Circular deck on top of leg at left is for helicopter landings.

NOW BENDIX FUEL INJECTION HELPS DRILL TO 25,000 FT. IN 100 FT. OF WATER

A new mobile offshore drilling platform, the "Julie Ann", combines the desirable features of both mechanical and electric drill rigs. It is powered by three 834 HP, 900 rpm White Superior diesels equipped with Bendix Fuel Injection.

The especially-designed power package, located on the main machinery deck, was built by the Diesel Engine Division of The White Motor Company, whose engines are noted for smooth powerful performance with quick response to load.

Constructed by R. G. LeTourneau, Incorporated, the "Julie Ann" is owned and operated by Dixilyn Drilling Corporation of Odessa, Texas—one of the foremost offshore drilling concerns. The platform is designed to drill six holes in a single location to depths of over 25,000 ft. while operating in over 100 ft. of water.

The ability of Bendix* Fuel Injection to meet the highest standards of unusual as well as conventional applications is another reason why more diesel engine manufacturers are specifying Bendix than ever before in history. *REG. U. S. PAT. OFF.

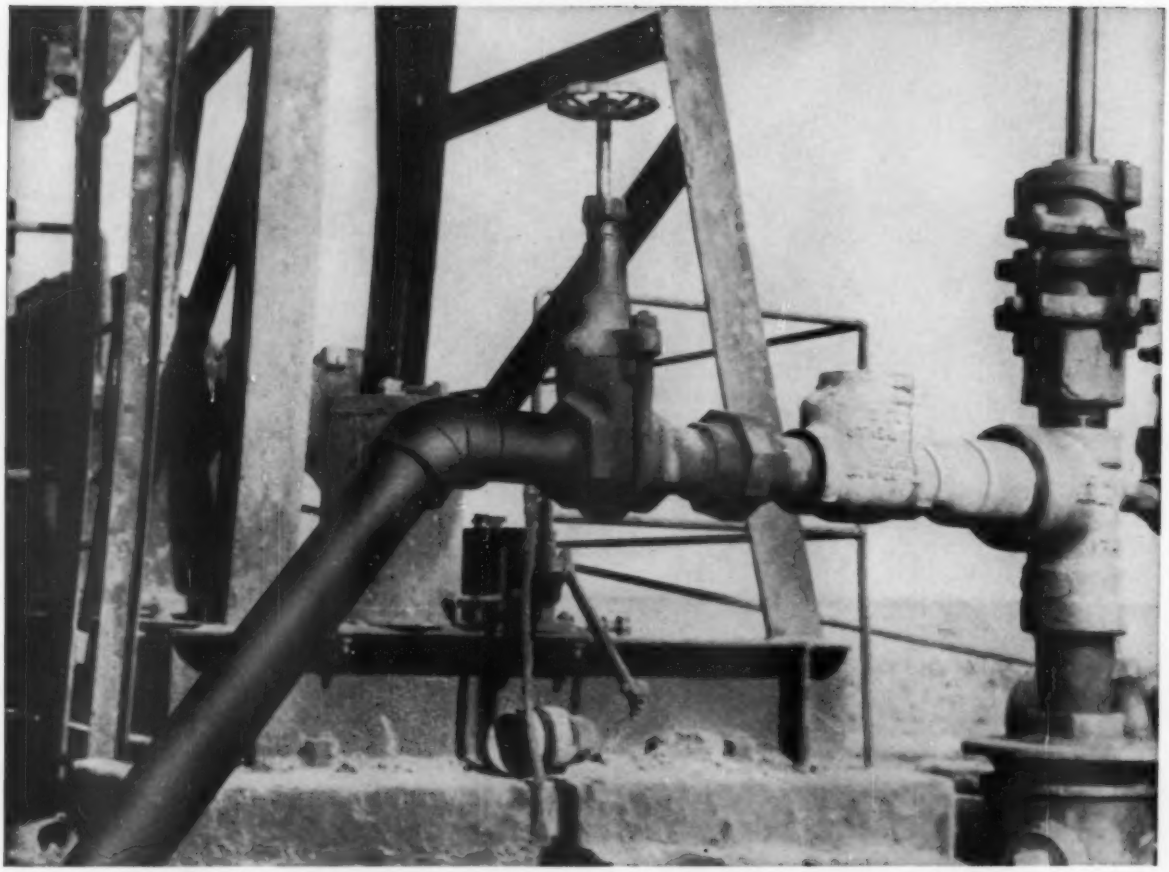
Export Sales & Service: Bendix International Division, 205 E. 42nd St., New York 17, N. Y.

One of three White Superior diesels equipped with Bendix Fuel Injection. This engine provides mechanical drive for a main mud pump and electric power for motors driving draw-works and independent mud pump.

Scintilla Division
Sidney, New York

Bendix
AVIATION CORPORATION

USCOFLOW PLASTIC PIPE



Mr. Usco says:

PIPE IN NEW SAVINGS with UscoFlow!

In these days of constantly rising costs, UscoFlow plastic pipe has become a big hit in the oil fields. Oil men will tell you it slashes plenty of overhead costs because UscoFlow is:

- Immune to galvanic corrosion.
- Highly resistant to both salt water and sour crude oil.
- Low in installation cost.
- Easily installed with solvent-welded fittings.
- Virtually maintenance-free.

That's why UscoFlow Pipe eliminates the severe corrosive problems found in handling salt water and sour crude. *It brings savings in piping replacement and maintenance that will continue for an indefinite time.*

New, black UscoFlow Pipe has great impact strength and handles high pressures, yet is semi-flexible and light in weight. A complete line of pipe and fittings is available through supply stores in all oil fields.

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...feed it to a gas-scrubbing unit and let the laws of equilibrium take their course. Tremendous volumes of natural or refinery gas can be freed of hydrogen sulfide or carbon dioxide as Jefferson Ethanolamine does its work over and over again.

For *any* application, Jefferson Ethanolamines are available in the purity and volume you need—backed by excellent service from modern production facilities. **Jefferson Chemical Company, Inc., 1121 Walker Avenue, Houston 2, Texas.**

Mono-, Di- and Triethanolamine are available in tank cars of four to ten thousand gallon capacity, in tank wagons, and in 55-gallon drums.

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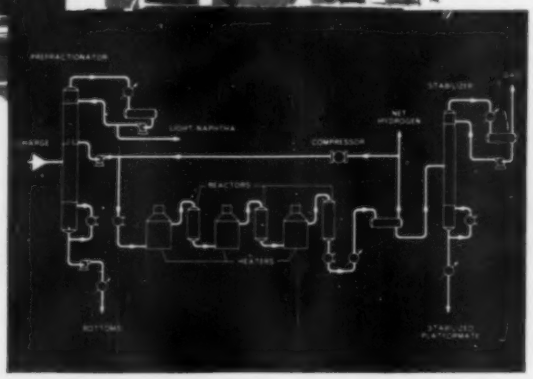

Produces high octane gasolines, high purity aromatics

No longer need low octane gasolines be a serious problem in refinery economics, thanks to the remarkably versatile refinery tool—UOP Platforming.

Inexpensive to install, easy to operate, reliable and safe, Platforming serves an important dual purpose: Using a platinum-containing catalyst which can operate for long periods without serious deactivation,—hence, expensive regeneration equipment is unnecessary—this practical process provides truly continuous production of superior quality motor fuel from straight run naphthas.

Equally important, it enables the refiner to produce in commercial quantities excellent base stocks for aviation gasoline and Platformate for aromatic extraction such as benzene, toluene and xylenes, now in such growing demand for detergents, nylon, plastics, high explosives and many other products.

As shown in the accompanying flow diagram, the Platformer is a compact unit consisting of a reactor section, stabilizer section, and (optional) feed preparation section. It can handle the full boiling range gasolines without prefractionation, or naphtha cuts separated from them, and efficiently processes any naphtha from crude distillation, natural gasoline plants or cracking units.

Platforming is but one of many UOP refining and petrochemical processes for improving refinery efficiency and producing more salable products. Available to refiners everywhere, these processes are illustrated and described in an informative new booklet. Write for your copy today. Address:

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More Than Forty Years Of Leadership In Petroleum Refining Technology

A painter prompted a new look

When one of our maintenance department painters was redecorating the treasurer's office, he asked about U.S. Savings Bonds. "If I could buy these Bonds on installments," he said, "and you could take my payments out before I got my paycheck, I'd hardly miss it."

Our treasurer explained that the Payroll Savings Plan does exactly that and gave the painter an application card. But the matter didn't end there, for our painter had given *us* something, too: an idea that helped to put real color into our plan.

He made us realize that if he was unfamiliar with this plan, many others must be in exactly the same position.

Our State Savings Bond Director helped us pass the word. Under his direction, we set up a company-wide campaign that gave the whole Payroll Savings story to every person in the Company. Within a few days we had the best employee participation we've had since the mid-forties.

People are quick to take advantage of this sound, automatic way to save money. Today there are more payroll savers than ever before in peacetime. Look up your State Director in the phone book or write: Savings Bonds Division, U.S. Treasury Department, Washington, D.C.

The Oil and Gas Journal
Tulsa 1, Oklahoma

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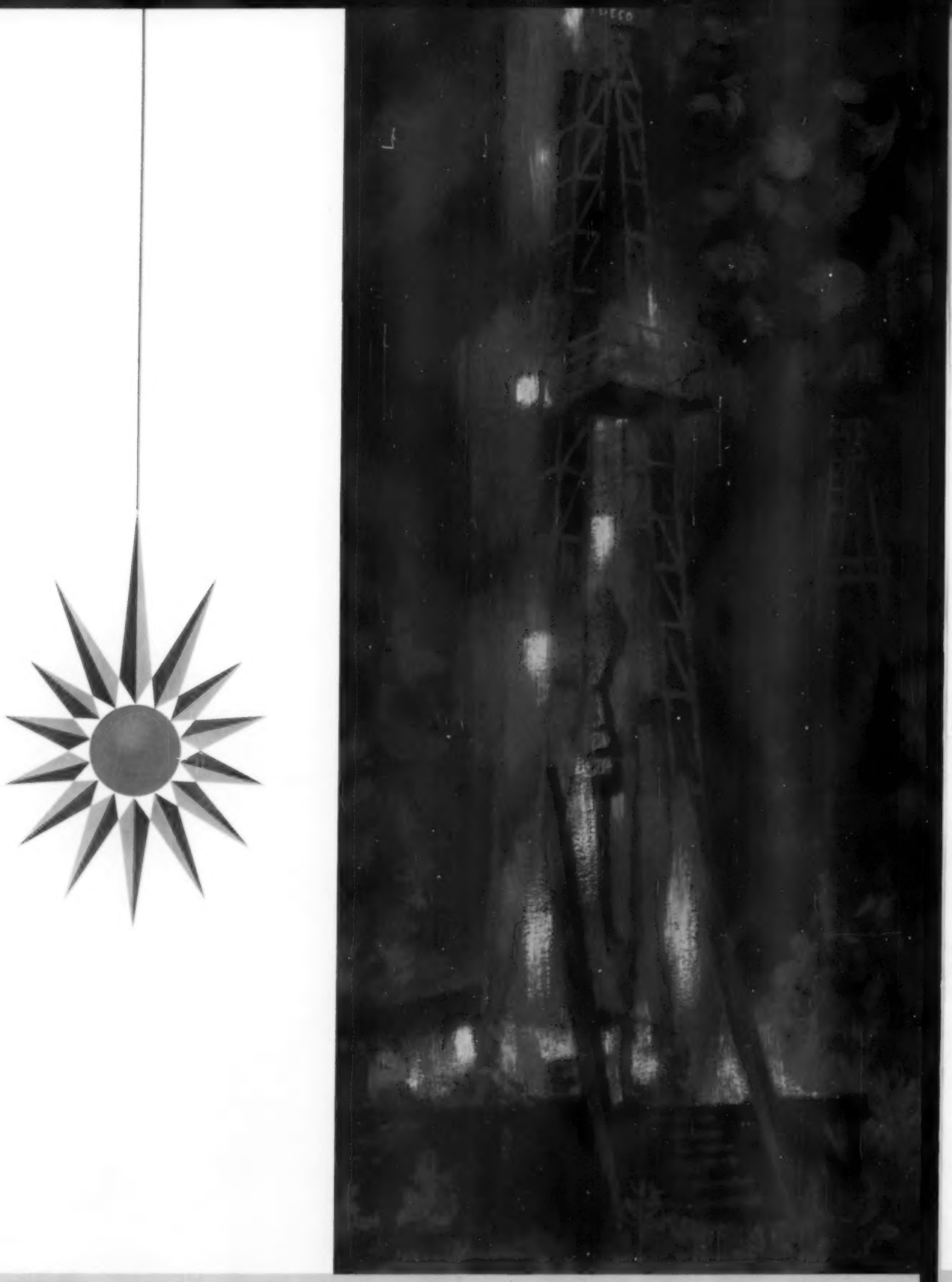

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Peace on Earth to Oilmen Everywhere in an industry that is just completing its first century of service to mankind in making the world a better place to live, love and work.

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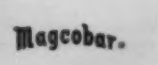

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drilling mud

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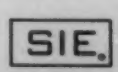

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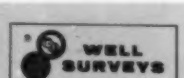

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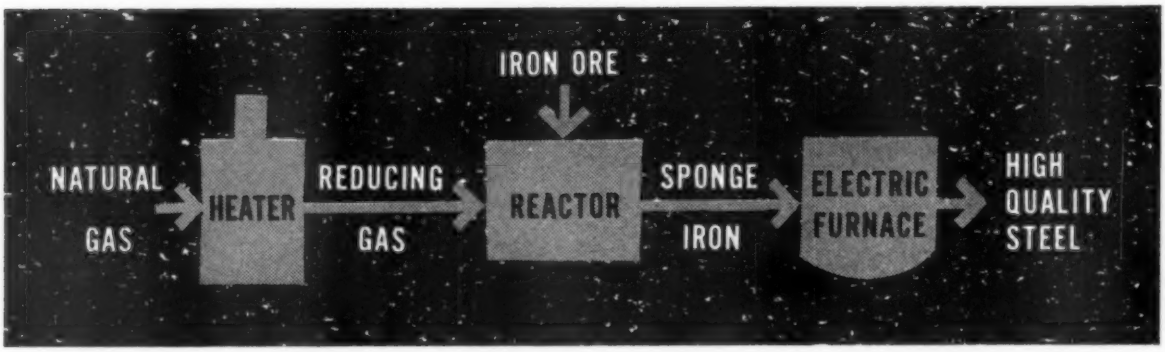
BROADER MARKETS

for Petroleum or Natural Gas with New Sponge Iron Process available through M. W. Kellogg



A steel industry based on iron ore and petroleum or natural gas is economically and operationally practical using a direct reduction process available through The M. W. Kellogg Company, exclusive world-wide sales and licensing agent. The process yields a sponge iron which can be substituted for the pig iron or scrap charge to electric or other melting furnace.

The success of the sponge iron process has been firmly established in a 30 ton per day pilot plant and a 200 T/D production plant operated by Fierro Esponja S.A., an affiliate of Hojalata y Lamina S.A.—one of Mexico's principal steel producers. Based on the success of the present plant, HyL has awarded Kellogg a contract to engineer and construct a 500 T/D plant incorporating further improvements in thermal efficiency and materials handling.

Reduction of ore to sponge iron occurs in a controlled-atmosphere reactor. Neither coal nor limestone is required. Small, low-investment plants can be designed to meet practically any need and can be constructed at far below the cost of a blast furnace. The process was developed by Hojalata y Lamina—parent company of Fierro Esponja. The problems of economically obtaining a reducing agent from natural gas or petroleum, and of engineering and constructing the 200 T/D plant, were solved by Kellogg on the basis of its extensive experience in furnace engineering and hydrocarbon processing.

This is another contribution by The M. W. Kellogg Company to oil technology which promises an increased use of natural gas or petroleum throughout the world. Its wide experience in engineering and constructing refineries and petrochemical plants qualifies Kellogg to design and build plants for the sponge iron process.

For those desiring further information, a booklet explaining the sponge iron process in more detail is available. Arrangements for screening a motion picture showing the sponge iron process in action may also be made by writing The M. W. Kellogg Company.

M KELLOGG W

THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17, N. Y.

A SUBSIDIARY OF PULLMAN INCORPORATED

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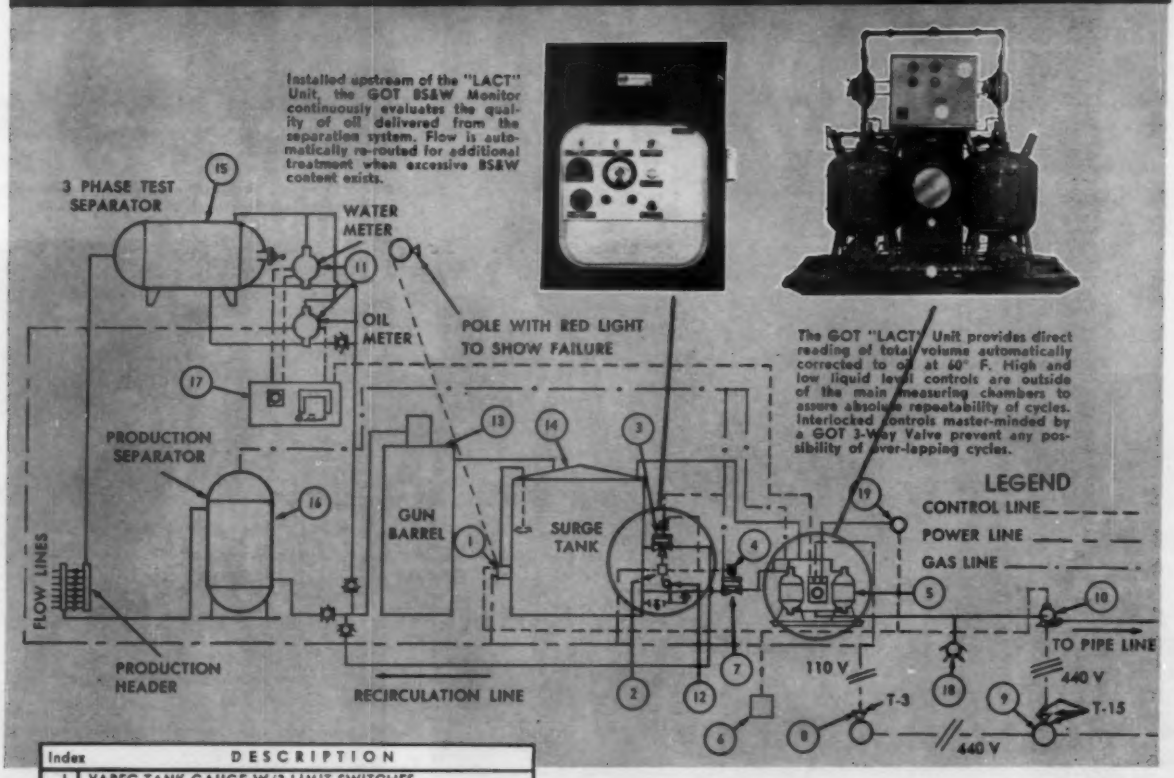
THIS GOT "LACT" SYSTEM IS SAVING MONEY ON A SOUTH TEXAS LEASE


Installed upstream of the "LACT" Unit, the GOT BS&W Monitor continuously evaluates the quality of oil delivered from the separation system. Flow is automatically re-routed for additional treatment when excessive BS&W content exists.
3 PHASE TEST SEPARATOR
WATER METER
OIL METER
POLE WITH RED LIGHT TO SHOW FAILURE
PRODUCTION SEPARATOR
GUN BARREL
SURGE TANK
FLOW LINES
PRODUCTION HEADER
RECIRCULATION LINE
TO PIPE LINE
110 V
440 V
T-3
T-15
The GOT "LACT" Unit provides direct reading of total volume automatically corrected to oil at 60° F. High and low liquid level controls are outside of the main measuring chambers to assure absolute repeatability of cycles. Interlocked controls master-minded by a GOT 3-Way Valve prevent any possibility of over-lapping cycles.
LEGEND
CONTROL LINE
POWER LINE
GAS LINE

Index	DESCRIPTION
1	VAREC TANK GAUGE W/3 LIMIT SWITCHES
2	GOT B. S. & W. CUT MONITOR
3	GOT 2" TYPE "TPO" DIAPHRAGM MOTOR VALVE
4	SOLENOID PILOT VALVE
5	GOT LACT—2 METERING UNIT (W/BUILT IN CHECK UNIT)
6	GOT SURGE TANK PUMP CONTROL PANEL
7	GOT 2" TYPE TA DIAPHRAGM MOTOR VALVE
8	TRANSFORMER 440V—110V (FURNISHED BY REA)
9	TRANSFORMER 12000Y-440Y (FURNISHED BY REA)
10	PIPE LINE PUMP
11	1 BBL. DUMP METERS
12	MONITOR CIRCULATING PUMP
13	GUN BARREL 8" x 24' ¼" x ¼" x ¼" 220 BBL.
14	SURGE TANK 400 BBL. CONE BOTTOM ¼" x ¼" x ¼"
15	3 PHASE SEPARATOR 30" x 10'
16	PRODUCTION SEPARATOR
17	OPERATIONS RECORDER & TEST TIMER
18	LINE SAMPLER
19	MONTHLY ALLOWABLE LIMIT SWITCH

Heart of this system is a GOT "LACT" Unit that provides continuous delivery of accurately metered fluid. Total volume is recorded on a mechanical counter after automatic temperature compensation. This unit has been proved in the field to be more accurate than manual gaging. It has been approved by the State regulatory body, and is accepted by most gathering systems and transmission companies.

To assure pipeline-quality oil, all production is scanned by a GOT BS&W Monitor . . . another indispensable GOT contribution to workable automatic custody transfer.

Like this major company*, you too can save money with GOT Automatic Custody Transfer. More experience . . . more field-proved components . . . more systems in actual operation . . . these assure you of the utmost in accuracy, dependability and economy. Write today for details.

***Name furnished upon request. Inspection of system can be arranged.**

The GOT Type "A-3" Fluid Meter is for use where automatic gaging alone is desired, and for automatic custody transfer where continuous delivery is not required. Fluid cannot enter high level control until main chamber is completely full, after which the exact volume within the chamber is isolated by the upper valve. Low level is actuated only after chamber has emptied completely. With interlocked controls actuated by a GOT 3-Way Valve, this design assures absolute repeatability of metering cycles.

got

Garrett Oil Tools, Inc.

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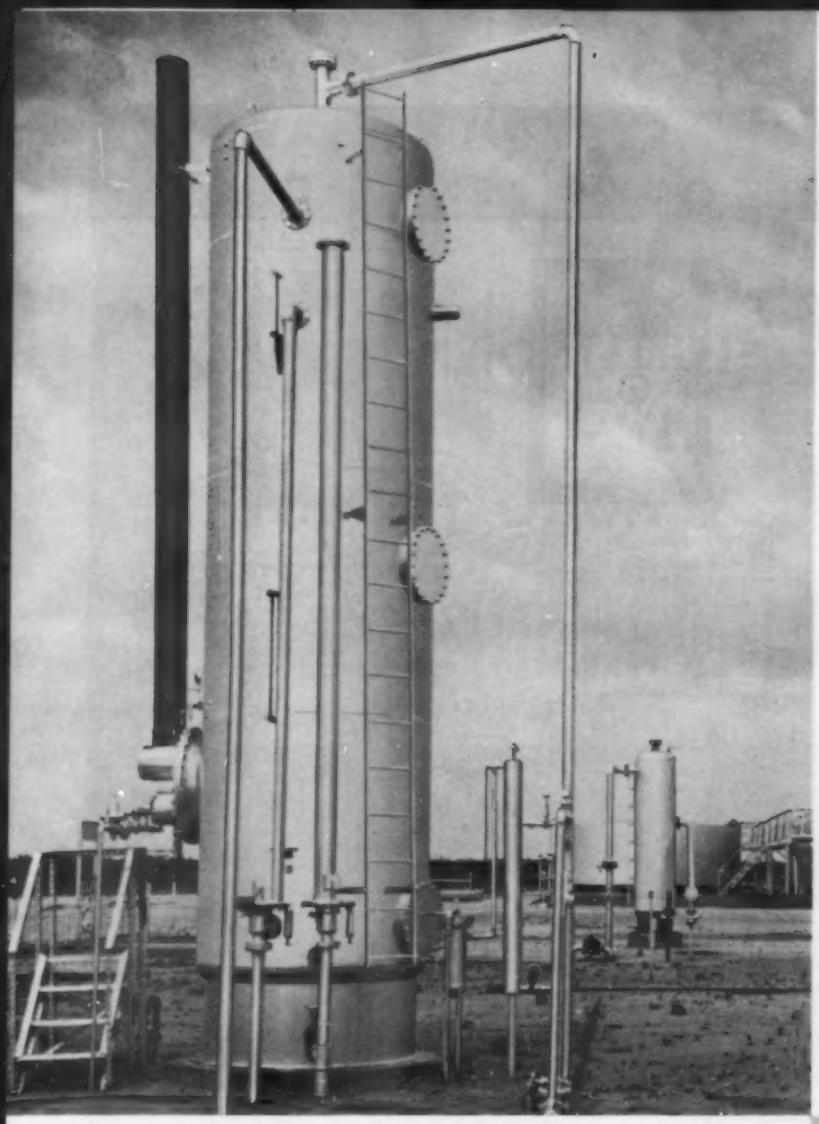
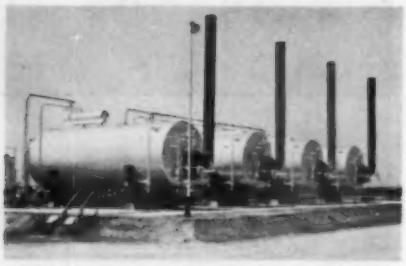
USI

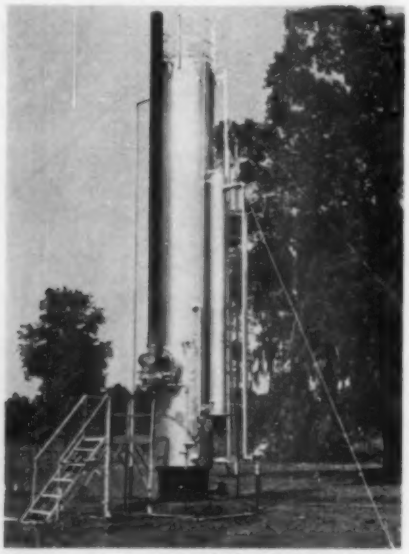
DIVISION OF U. S. INDUSTRIES, INC.



Type "S" Treaters give optimum low cost treating under average lease conditions.



"HGT" Treaters handle large volume requirements . . . are excellent for tough treating conditions.



Type "J" (above) also handles "tough" treating jobs. Types "SCW" and "JCW" (below) are designed for operation in cold climates.

MATCHING TREATERS AND DOLLARS!

Don't "shortchange" yourself by operating any treater on your lease that fails to deliver maximum return per dollar invested!

No matter how "average" or how "tough" the operating conditions on your lease, BS&B has the right size and type of treater to do your job most efficiently.

Let your BS&B Man help you select the right treater for your particular lease conditions.

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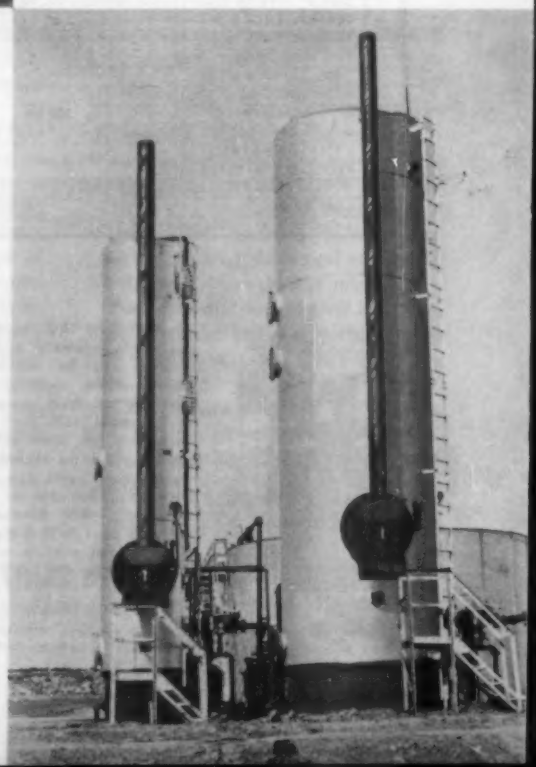
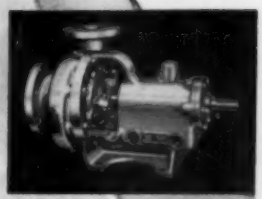


"NOW-WE CAN BE SURE!"

Pump Buyers are saying this about Peerless Process Pumps–



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fmc FOOD MACHINERY AND CHEMICAL CORPORATION

Peerless Pump Division

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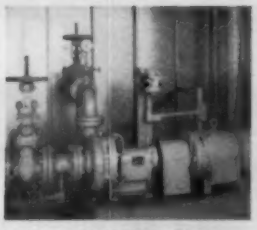
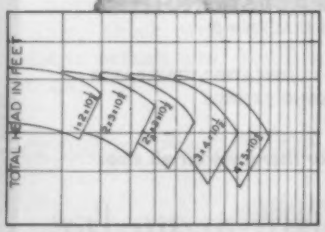
Offices: New York, Atlanta, St. Louis, Phoenix, San Francisco, Chicago, Fresno, Los Angeles, Plainview and Lubbock, Texas, Albuquerque. Distributors in Principal Cities. Consult your telephone directory.

HERE ARE 4 CONVINCING REASONS WHY:

THEY OFFER the type of quality construction that measures up to any standard. Continual checking at every stage of manufacture guarantees the buyer performance he can count on in the field. *The best!*



THEY PROVIDE the performance you expect and pay for, backed by actual operating records of Peerless pumps in installations like yours. Durability, dependability, efficiency—*all proved in service.*



THEY MEET *exactly* every pumping requirement, handle any job in your system that calls for a pump. The *complete* Peerless range offers *all* types of chemical process pumps, in *all* sizes and frames.

AN EXAMPLE of Peerless research is this recently released bulletin on the effects of radial loads in process pumps, "MECHANICAL CONSIDERATION IN PUMP DESIGN." Request Bulletin No. EM-79.

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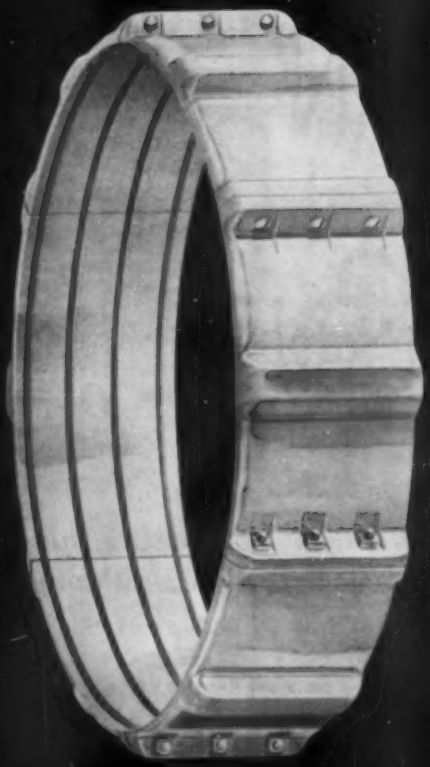

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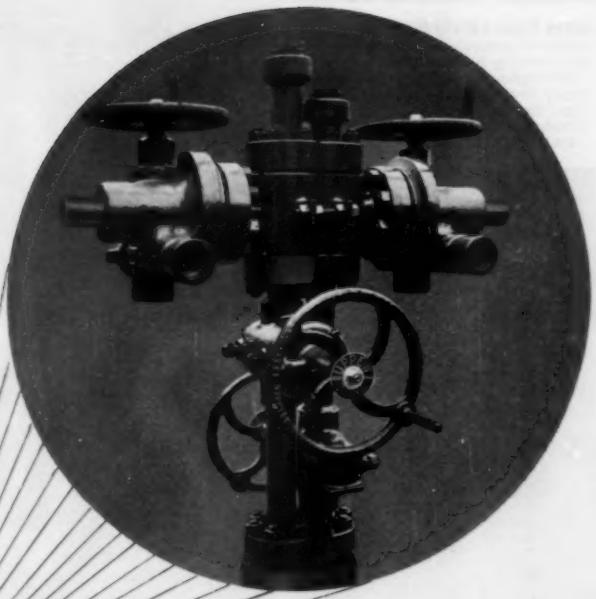

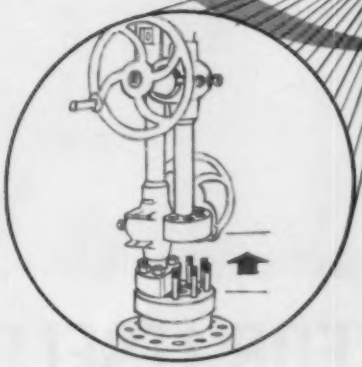

gives dual tree flexibility, economy

Another major advancement from the leader in multiple well completion equipment is incorporated in the Oil Center Tool Company's Crescent Flange Tree.

It features: ★ Simplicity ★ Flexibility ★ Economy

All of these result from the fact that it is no longer necessary when the Crescent Flange Tree is used, to remove both valves in a dual well when one is to be replaced. The ultra-simple design allows you to replace one valve without disturbing the other.

The Crescent Flange Tree is the newest example of how the Oil Center Tool Company employs depth in research and development to deliver the best possible wellhead equipment.

For more details on the Crescent Flange Tree, check with the O-C-T representative nearest you. You'll be glad you did.

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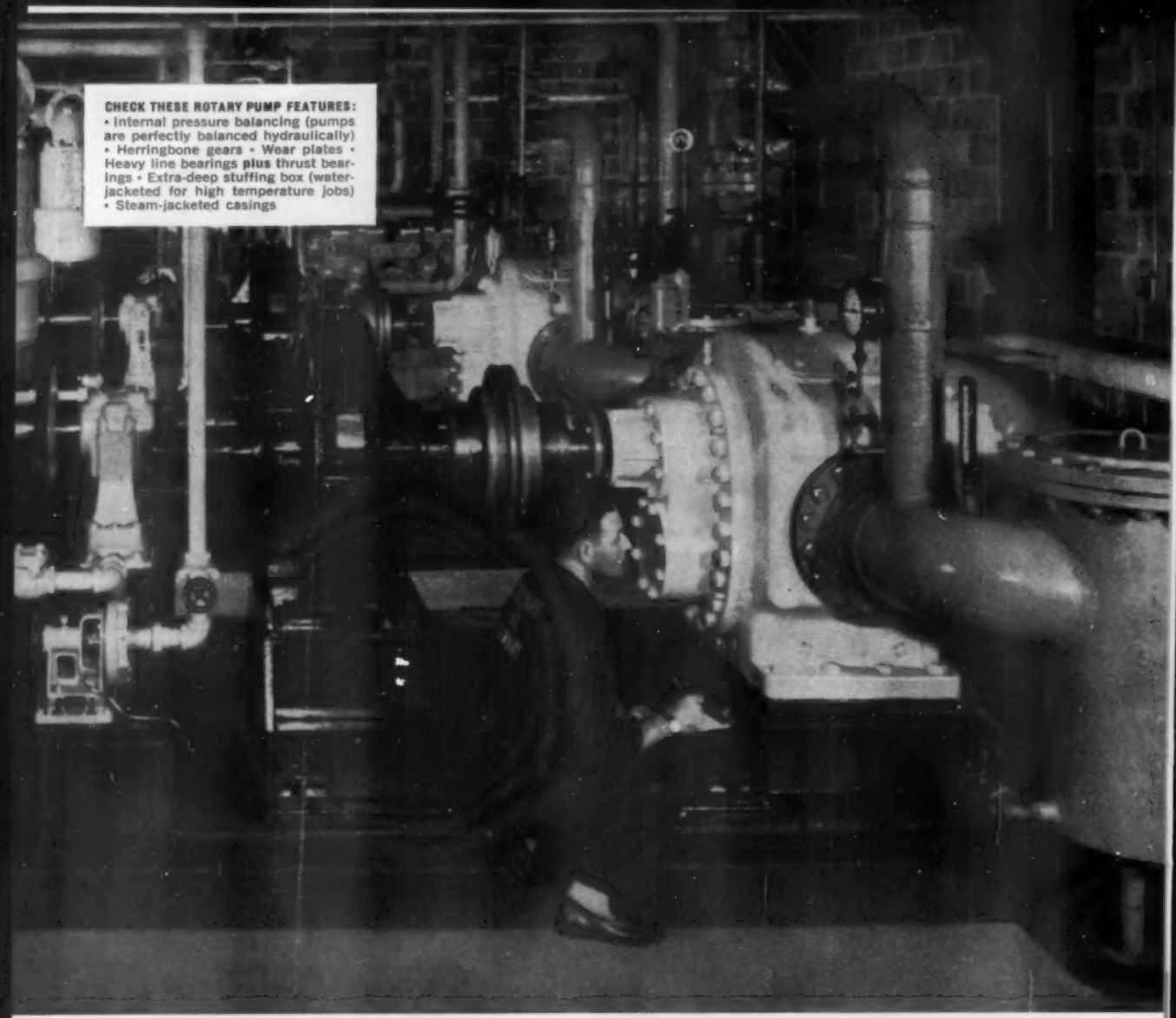
CHECK THESE ROTARY PUMP FEATURES:
• Internal pressure balancing (pumps are perfectly balanced hydraulically) • Herringbone gears • Wear plates • Heavy line bearings plus thrust bearings • Extra-deep stuffing box (water-jacketed for high temperature jobs) • Steam-jacketed casings

THE PUMP THAT PAYS FOR ITSELF

Greater efficiency, power savings make rotaries the pumps to use for medium and high viscosity service.

It's true rotary pumps cost a bit more than centrifugals . . . about 25% more. But that's purchase price only. You can quickly make up this higher first cost by applying rotaries on jobs they've been designed for. Such jobs are high-capacity oil transfer in tanker loading, gathering, or tank farms. As a matter of fact, you can even save so much the rotary will pay for itself!

True? Of course. Take this typical example. On medium viscosity crude oil a centrifugal pump might have an efficiency of 50%. A rotary pump performing the same service might have an efficiency as high as 80%, thus requiring *60% less power*. And electric power saving isn't all.

Rotary pumps are self-priming, and operate under very low absolute suction pressure throughout entire viscosity range. This means rotary pumps have low required Net Positive Suction Head (NPSH). They have the same high-speed smooth flow of a centrifugal pump, too, but have positive displacement. That is, they eliminate pulsating flow. And *only Worthington* makes rotary pumps as large as 16 inch suction and discharge. Ask your nearest Worthington representative for the full rotary pump story. Or, if you prefer, write to Worthington Corpoı tion, Section 20-4, Harrison, N. J. In Canada, Worthington, Ltd., Brantford, Ontario.

WORTHINGTON

New kind of offshore project is served by Sikorsky helicopters

STEEL ISLAND will stretch for nearly a mile in the Gulf, 7 miles off Grand Isle, Louisiana, supporting world's first offshore sulphur mining plant. Sikorsky helicopters furnish quick, dependable transportation from supply points on shore.

In the Gulf of Mexico off Louisiana, a 15-tower steel island is being built to accommodate the world's first offshore sulphur mining plant. A project of Freeport Sulphur Company, the structure will stretch for nearly a mile. It includes heavy and complex mining facilities, living quarters for 250 men . . . and, of course, a heliport.

As with so many important projects involving the discovery or development of natural resources, helicopters are flying men and cargo between the operating location and its supply points. Naturally, the helicopters are Sikorskys.

Only Sikorskys have furnished heavy-payload helicopter transportation to the oil industry on regular schedules to offshore rigs and to sites in jungles and other inaccessible areas. If transportation is a problem where you want to operate, Sikorsky helicopters may provide an answer. Write for information.

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NEW

FIGURE
92

The Figure 92 Casing Head is the most recent addition to the Larkin line of Tubing Heads and Casing Heads.

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2. Forged steel body
3. Full opening—to accommodate centralizers or other tools
4. Hinged 3-segment slips (a locking device allows dropping through preventer)
5. Oil resistant Hycar packing
6. Tapered API top thread for direct flanging
7. Economical

Compact in design—rugged in construction—The Figure **92** is the ideal Casing Head for wells of medium depths and pressures. Order a Figure **92** for your next well . . . Through Your Supply Store.

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...Through Your Supply Store

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They Say—

We erred in headline

Dear Sir:

Apparently a journalist cannot resist an opportunity to be sensational. Stanley Belonos and I submitted a paper for your consideration which was published in the November 17 issue of The Oil and Gas Journal (p. 155). The title of this article as published in the Journal came out "Dents in Pipe Spell Trouble."

There is nothing in the article that could be interpreted to show that a dent would mean trouble in a pipeline. In fact, the paper was written to inform the gas industry that dents of the type studied in our investigation do not affect the service performance of pipelines.

Robert S. Ryan
Columbia Gas System
Service Co.
Columbus, Ohio.

Is old prediction wrong?

Dear Sir:

A recent issue had in it an article saying no oil will be found south of the Santa Ana River ("A 50-Year Prediction Holds Water," OGJ, Oct. 6, p. 288). Well, I say that whoever wrote this statement a long time ago is all wrong because of the following information:

J. B. Nelson's Lillibridge Government No. 1, spudded September 9, 1958, total depth, 1,722, tested oil sands at 1,000-1,200 ft. The well is now waiting to whipstock to pass stuck drill stem which is on bottom. A fish job was unsuccessful.

This is the third well drilled south of the river that had shows and the only one to be tested. The well is in Riverside County, California, northwest of Corona and east of the Prado dam area and the Chino field.

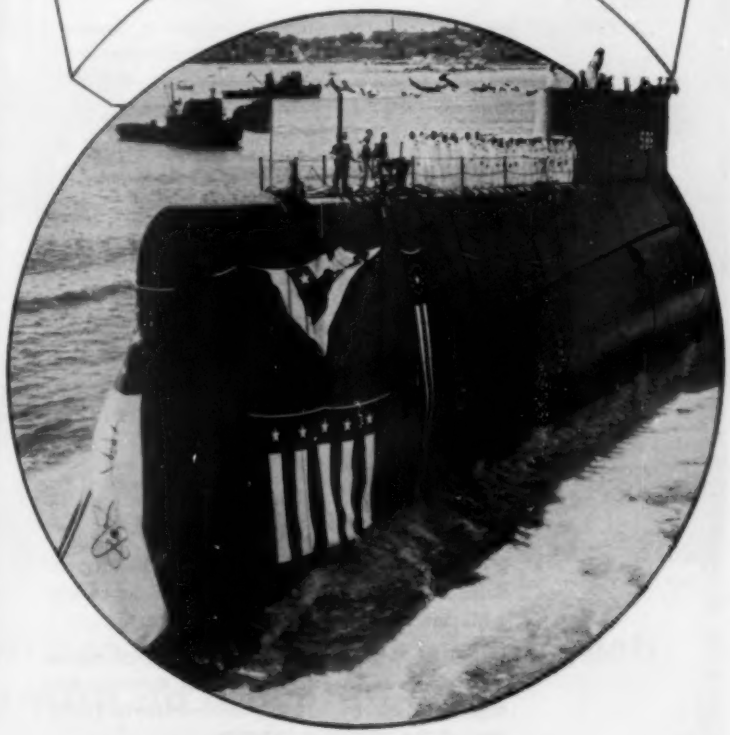
Alvin H. Bloodworth
Ontario, Calif.

Taxes hide oil's services

"It looks as if the Government is going to be short about $900 million in highway money in fiscal 1960, and if this expected shortage were to be made up through gasoline taxes the rate would have to go up about 2 cents a gallon.

"Here we are, providing the motorist with a motor fuel which has been so vastly improved in 10 years

BONNEY WELDOLETS
for the world's biggest
ATOMIC SUBMARINE



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problem: How to apply linear programming techniques to processing operations of a huge oil refinery to develop more profitable operating methods.

problem: How to use computers to solve such marketing research problems as service station locations, warehouse locations, and predictions of sales.

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you can hardly recognize it, giving him day and night service and more free extras than any business in the country. We're doing all this at a price which has risen far less than the price for other products which haven't been improved. But because of excessive taxes, a very great part of this accomplishment is hidden from our customers.

"If the federal gasoline tax is increased once more, it will surely encourage the states to follow suit. Before we know it, we'll have 15-cent tax decals on our pumps and gallonage will start falling off. And once customers balk at buying gasoline because of a tax that's six or seven times the tax rate on luxuries, the whole growth of your business will stop."

S. D. Breitweiser, vice president for marketing, D-X Sunray Oil Co., and president, Oklahoma Petroleum Council, in a speech to members of the Volunteer State Oil Committee, Nashville, Tenn.

Farm group views gas tax

"Recently the Budget Bureau director stated that by fiscal year 1961 the Highway Trust Fund would be running a deficit of about a billion dollars a year. He indicated that we have a choice of either increasing the federal gasoline tax or dipping into the Government's general funds.

"Last year we declared ourselves in opposition to any increase in any federal automotive excise taxes. The position is as sound today as it was then."

Statement of the National Grange at its annual meeting in Grand Rapids, Mich.

Customs union worth study

"I think we need to take a new look at the development of customs unions, free-trade areas, and similar devices to broaden regional trading areas. The customs-union idea has in Canada been suspect for fear it would lead to political union, although I doubt if Canadians are as afraid of this happening today as they once were.

"Another argument against the customs-union concept is that it is not fully multilateral and could actually result in more rather than less discrimination.

"But against these is the undeniable fact that such arrangements constitute one of the few instruments actually working to widen the areas for unrestricted trade. Which means they are working to widen the areas within which businessmen can base their decisions on economic rather than

Du Pont FOA-2 is added to residual fuel as it's pumped into sludge-ridden tank.

$20 worth of FOA-2 saved $800 desludging job ... and with no downtime

A power plant serving two industrial laboratories burns between 1,000 and 1,500 gallons of residual fuel, daily, from a 50,000-gallon tank.

Recently, it was discovered that six inches of sludge had accumulated in the bottom of the tank. Constant temperature had to be maintained in the laboratories, so a tank-cleaning firm was called in. They gave a firm estimate of $800 for cleaning the tank mechanically. Considerable downtime would be required.

This is the powerhouse that had to maintain service, so that essential temperature control, in the laboratories it served, could also be maintained.

Looking for an alternative, the power superintendent decided to try using Du Pont Fuel Oil Additive No. 2 to break down the sludge. After one week of operation, during which only $20 worth of FOA-2 was used, no sludge could be detected. Moreover, there was no downtime. *The tank was in use all during the clean-up period.* Boiler room operations were completely trouble-free throughout the time the sludge was being dispersed and burned with the oil.

In addition to sludge removal, prevention of sludge is an improvement FOA-2 gives residual fuels. It is an excellent stabilizer, solubilizer, and dispersant.

Being nonmetallic, the additive burns with the fuel, leaving neither ash nor other residue. Refiners as well as their customers profit from the use of FOA-2, because it helps to stabilize all forms of distillate fuel oils, as well as residual fuel. These include blends such as catalytic-cracked stocks combined with straight-run products.

Your Du Pont representative can give you further details. Or write for a copy of our comprehensive 24-page FOA-2 book. It contains complete technical and experimental data. E. I. DU PONT DE NEMOURS & CO. (INC.), Petroleum Chemicals Division, Wilmington 98, Delaware.

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For heavy duty—**anywhere in the field**—the famous Leland "Packaged Unit" is the safest, toughest, easiest, speediest all-purpose truck body. Designed and built for gin pole winching and rough terrain work, the "Packaged Unit" suits you to a "T". Write for fully illustrated catalog today.

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political considerations. And this also means that such unions are facilitating those vast investments which are necessary to generate 20th-century living standards.

"The extension of trading areas must be achieved somehow and it seems more likely to take place on some sort of regional than on a global basis. Continental economic unity, for example, must be given similar status to continental defense unity. The present curious situation in which you can be a man's ally in a military sense but be something bordering on the opposite in an economic sense, is not compatible with lasting security."

J. R. White, president, Imperial Oil, Ltd., in a speech to the Canadian Society of New York.

Pennsylvania gas prospects

"While we have become more and more dependent on supplies from the southwest, this has not deterred our efforts in the least to locate new supplies of gas in Pennsylvania.

"The Consolidated System produced more gas in the Appalachian area during the year 1957 than in any year since 1916. It is only when considered in conjunction with our greatly expanded demand that this supply seems small.

"Our own geologists foresee the day of ultradeep drilling in the Appalachian area that could bring about the discovery of new fields whose production could even rival the prolific production of the southwest.

"This is not beyond the realm of possibility or even probability, but it must await the day when the market price of gas, in competition with other fuels, can economically support such deep drilling."

H. D. Borger, president, Peoples Natural Gas Co., in a speech to the Armstrong County chapter of the Pennsylvania Economy League.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

JANUARY

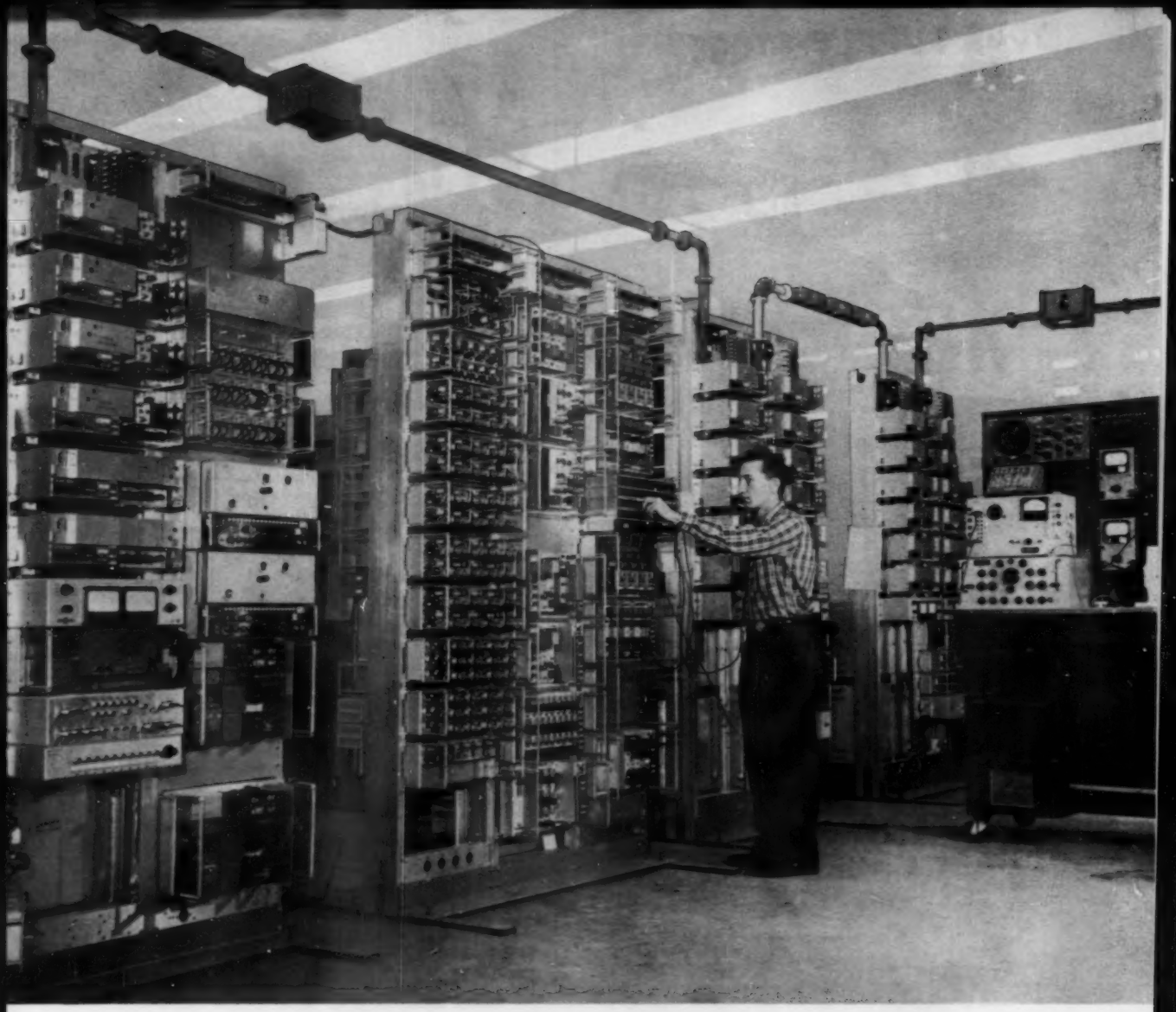
12-14 Pipe Line Contractors Association, eleventh annual convention, Americana Hotel, Miami Beach, Fla.

12-16 Society of Automotive Engineers, annual meeting and engineering display, Sheraton-Cadillac and Statler hotels, Detroit.

16-17 Association of Oilwell Servicing Contractors, annual meeting, Baker Hotel, Dallas.

22-23 National Association of Corrosion Engineers, Houston section, annual short course, University of Houston campus, Houston.

22-24 Texas Society of Professional Engi-



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Collins racks are assembled, wired, tested and shipped as a unit to each site ready for setting in place and going to work.

Your microwave dollar buys more service, more reliability, more flexibility and more value when you specify *Collins*. For complete information, write or call Microwave Sales Division, Collins Radio Company, 1930 Hi-Line Drive, Dallas 7, Texas.

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BAASH ROSS JOY

neers, annual convention, Shamrock Hilton Hotel, Houston.

23 Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.

26-29 Tenth annual plant maintenance and engineering conference, sponsored by Clapp & Poliak, Inc., Public Auditorium, Cleveland.

28-29 Annual Midwest Welding conference, sponsored by Armour Research Foundation of Illinois Institute of Technology, and American Welding Society, Chicago section, Illinois Institute of Technology, Chicago.

30-31 Oklahoma Society of Professional Engineers, annual meeting, Mayo Hotel, Tulsa.

FEBRUARY

1-4 American Association of Petroleum Geologists, Rocky Mountain section, ninth annual meeting, Civic Auditorium, Albuquerque, N. M.

1-6 American Society for Testing Materials, D-2 committee on petroleum products and lubricants, Sheraton-Jefferson Hotel, St. Louis.

2-22 Southwestern Legal Foundation, short course on oil and gas law, Southwestern Legal Center, Dalias.

11-13 Southwestern Legal Foundation, tenth annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

11-13 National Association of Corrosion Engineers, Tulsa section, tenth annual pipeline corrosion short course, Mayo Hotel, Tulsa.

16-18 American Management Association, seminar on management problems of exploration and production, Hotel Astor, New York.

15-19 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Sir Francis Drake Hotel, San Francisco.

24-25 University of Oklahoma, sixth geological symposium, Norman, Okla.

27 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

26-28 Pipe Line Contractors Association of Canada, fifth annual convention, Castle Harbour Hotel, Bermuda.

MARCH

3 Petroleum Equipment Suppliers Association, Pacific district, annual membership meeting, Ambassador Hotel, Los Angeles.

9-11 Midwest Gas Association, annual meeting, Hotel Fort Des Moines, Des Moines.

11 Petroleum Equipment Suppliers Association, southwestern district, annual membership meeting, Shamrock Hilton Hotel,, Houston.

13 American Institute of Chemical Engineers, Sabine area section; American Chemical Society, Texas-Louisiana Gulf section; sixth annual joint technical meeting, Lamar State College of Technology, Beaumont, Tex.

16-18 Western Petroleum Refiners Association, forty-seventh annual meeting, Hilton Hotel, San Antonio, Tex.

16-18 Society of Automotive Engineers, national passenger car, body, and materials meeting, Sheraton-Cadillac Hotel, Detroit.

17-18 Manufacturing Chemists' Association, air and water-pollution abatement conference, Netherlands Hilton Hotel, Cincinnati.

18 Petroleum Equipment Suppliers Association, eastern district, annual

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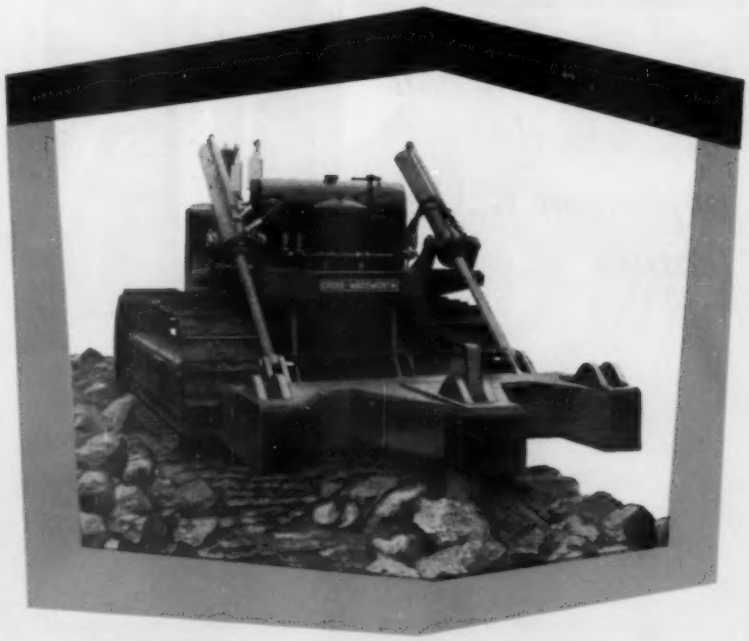

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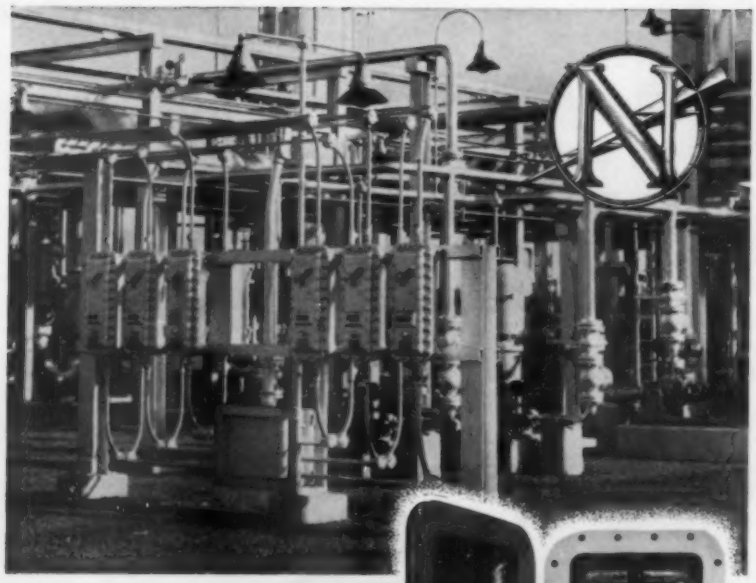

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membership meeting, Duquesne Club, Pittsburgh.

16-19 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, forty-fourth annual meeting, Memorial Auditorium, Dallas.

19-20 New England Gas Association, annual meeting, Hotel Statler, Boston.

25-27 American Petroleum Institute, Division of Production, southern district meeting, Roosevelt Hotel, New Orleans.

APRIL

2-3 Society of Petroleum Engineers of AIME, Rocky Mountain petroleum section, Casper, Wyo.

2-3 American Institute of Mining, Metallurgical, and Petroleum Engineers, technical conference on stress corrosion, Mellon Institute, Pittsburgh.

6-7 Instrument Society of America, second national symposium on chemical and petroleum instrumentation, St. Louis.

5-10 American Society of Mechanical Engineers, nuclear congress, Cleveland Auditorium, Cleveland.

8-10 American Petroleum Institute, Division of Production, eastern district meeting, Penn-Sheraton Hotel, Pittsburgh.

14 Independent Oil Men's Association of New England, annual meeting, Hotel Statler, Boston.

14-16 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.

15-17 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

15-17 American Petroleum Institute, Division of Transportation, annual tanker conference, Jung Hotel, New Orleans.

16-17 Rocky Mountain Oil and Gas Association, midyear meeting, Casper, Wyo.

19-23 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Shamrock-Hilton Hotel, Houston.

22-24 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Herring Hotel, Amarillo, Tex.

22-24 Natural Gasoline Association of America, thirty-eighth annual convention, Baker and Adolphus Hotels, Dallas.

26-28 Texas Independent Producers and Royalty Owners Association, membership meeting, Baker Hotel, Dallas.

30-May 1 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

MAY

1 Fourth annual petroleum accounting conference, sponsored by Wichita chapters of the Petroleum Accountants' Society of Kansas, National Association of Accountants, the Kansas Society of Certified Public Accountants, and the University of Wichita, Lassen Hotel and University of Wichita campus, Wichita.

3-6 Liquefied Petroleum Gas Association, twenty-eighth annual meeting and trade show, Conrad Hilton Hotel, Chicago.

4-7 American Geophysical Union, annual meeting, Washington.

5-7 Purdue University, fourteenth Purdue industrial-waste conference, Purdue Memorial Union Building, Lafayette, Ind.

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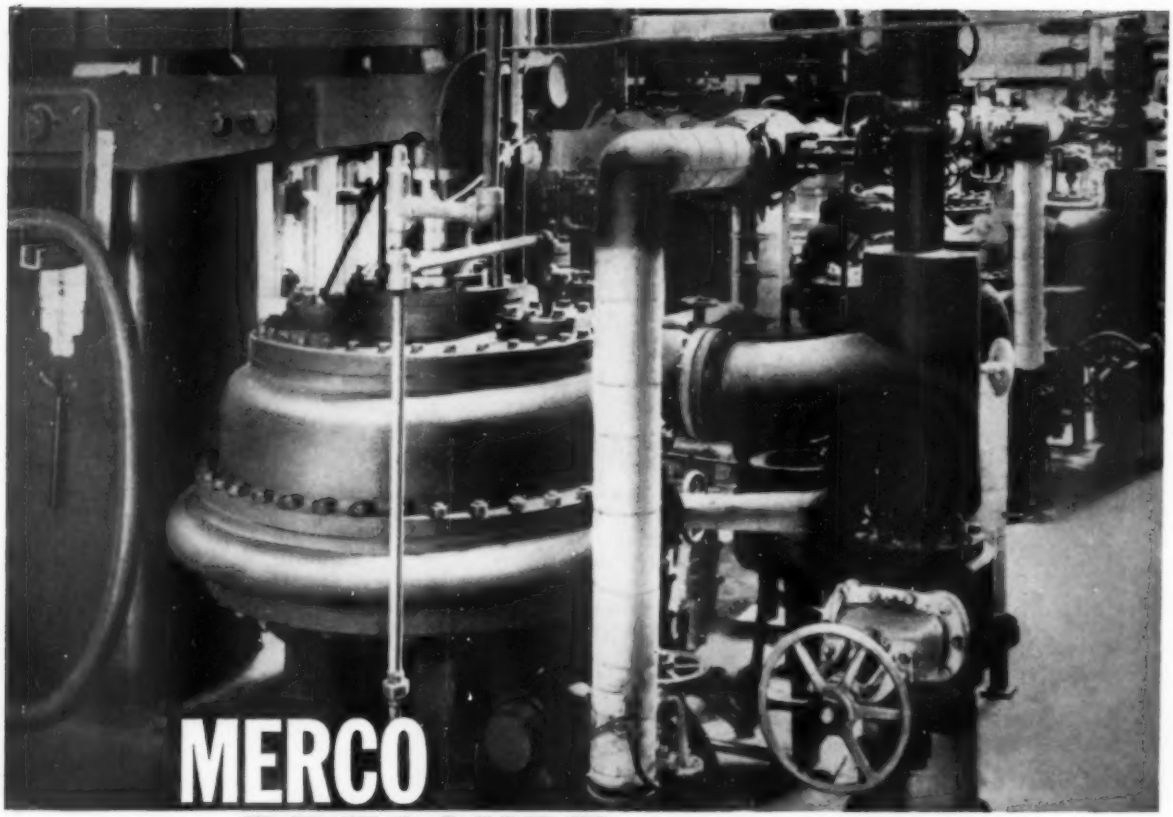

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JOURNALLY SPEAKING

Odd-ball Info

WITH ONLY a few more working days left in this old year it's time to take inventory, clean house, throw away junk, and get ready for a fresh start with the turn of the calendar.

So we're going through that bottom drawer where we stuff clippings, notes, and items that might—just possibly might—provide material for this column. We've already ruffled through it once without uncovering any mirth-shattering ideas. Now we'll see what closer scrutiny will do . . .

. . . Pretty poor material . . . Here's a sample—a note we scribbled while listening to an allegedly humorous after-dinner speaker: Samson was the greatest journalist in history, because he took two columns and brought down the house . . . Very disheartening example for a guy who can't even fill one column.

. . . Well, here's an interesting prediction: The manufacture of oil from coal will be commercially profitable as soon as the price of crude oil rises to 35 cents per gallon. It came from a book printed in 1865. It's a technical handbook on how to distill illuminating oil from pitch, tar, and soft coal, but it devotes one chapter to the upstart petroleum industry which seemed to be cutting into the lamp-oil business rather heavily . . . Ah yes, its author was none other than Dr. Abraham Gesner, the man who coined the word "kerosene," patented a process for making it from coal, and was on the way to raking in a fortune when some fool named Drake drilled an oil well . . . Gesner didn't think oil was here to stay. His book was not a best seller.

. . . Say, here's a different kind of prediction—recent, too. Seems that Jersey Standard scientists have found that oil is being formed right now in the mud of the delta of the Orinoco River in Venezuela. Whereas the oil from most fields is several million years o'd, here is a young field only 5,000 or 10,000 years old . . . Boy, is that good news. Now we don't need to worry about the world running out of oil. All we have to do is wait about 10,000 years for more to be formed.

. . . Yup, science is sure wonderful . . . Here's an example that's been at the bottom of the drawer for a long time: "Scientists have decided that the zebra is a light-colored animal with dark stripes—not a dark one with light stripes" . . . We have no comment on that priceless bit of information, but we thought you'd be relieved to know that this vexing problem has been solved.

. . . Scientists are brave, too. Witness this headline on a press release from Shell Oil Co.: "Survey shows women drivers are as good as men—almost" . . . No comment on that one, either.

. . . Oh, here's another item about a scientist: "When Alexander Graham Bell, inventor of the telephone, went to his workshop to wrestle with scientific problems he would stuff a towel around the telephone so it would not ring and interrupt him" . . . That one came from the National Geographic Magazine, which ought to know, because after Dr. Bell invented the telephone he founded that magazine to induce people to travel to places that didn't have phones . . . Odd folk, these scientists . . . But we sure envy Alex' courage in using that towel.

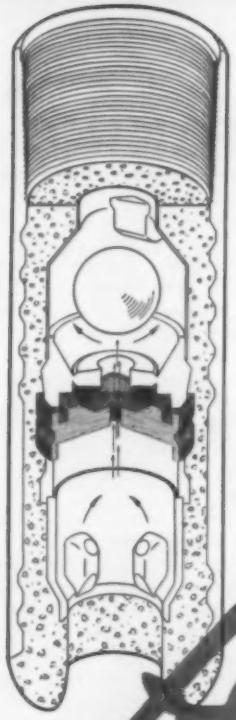
. . . Well, as Lady Godiva said at the end of her ride "I am now nearing my clothes" (close, clothes—get it?).

. . . So this would be a good place to confess our ignorance . . . Of all the useless and odd-ball information we have collected in our lifetime, we had never stumbled on a reference to "West (BG) Virginia." Until last week when we made the mistake of admitting in print that we didn't know what those two initials stood for and why they were stuck in the middle of the state's name.

. . . Ah me . . . It appears that everybody else (a) knew and (b) wanted to tell . . . We were deluged with letters and phone calls—even some long distance. And we should have had sense enough to anticipate that it would turn out to be something we couldn't print in a family magazine.

. . . It seems that after the Civil War, when the Yankees in those parts had seceded from Confederate Virginia and set up their own state, they wanted no misunderstanding about their loyalty and residence. So they shouted the word "West" and emphasized it with an irreverent oath before adding "Virginia" sotto voce. It's a habit that still persists among expatriots of that state . . . So now (by gum) we know.

—Henry D. Ralph



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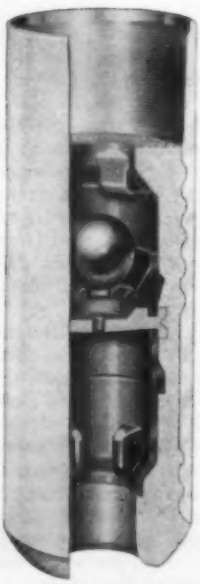

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The Memphis decision leaves the big question unsolved

The Supreme Court's decision in the Memphis case is a moderate victory for sensible interpretation of the Natural Gas Act and for sane regulation of the natural-gas industry.

It is a great relief to pipelines because it removes the uncertainty caused by the now-reversed decision of the lower court and returns rate regulation to the prior and well-established procedure.

It will permit resumption of orderly planning for expansion, financing, and acquisition of gas supplies. But it is certainly no bonanza for the industry nor a blow to consumers.

THE BEST THING about the decision for producers and pipelines alike is the recognition of "business reality," the "legitimate interests" of natural-gas companies, and the public's stake in the "financial stability" of the industry.

Such language could embolden the Federal Power Commission to take some firm steps toward realistic regulation of producers' prices and explore a practical way out of the 4-year stalemate resulting from the theory that producers can be regulated like traditional utilities.

Other than that there is little in the decision to give producers hope for a quick and easy way out of their regulatory dilemma.

Unlike pipelines, producers do not normally sell gas under a service agreement that omits specific prices. Therefore it is academic to them that a rate increase under a service agreement can be filed for FPC approval without the consent of their customers.

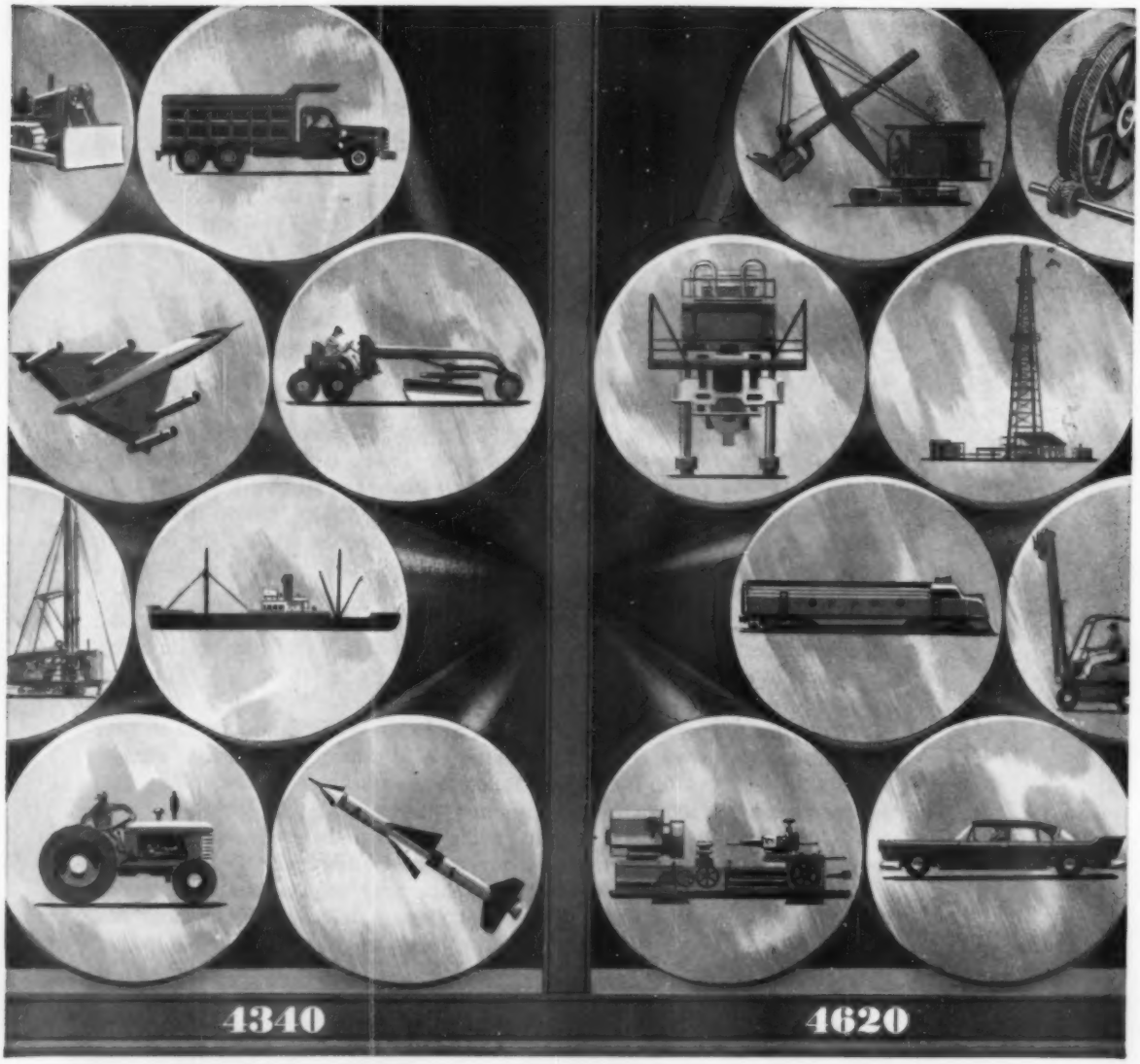
Producers are still bound by the terms of contracts setting forth specific prices during a definite period (as they were both before and after the older and more confusing Mobile decision). Such contract prices can be raised only with the consent of the buyer.

THE PRODUCERS' PROBLEM is to get FPC to approve a price which does have the consent of the buyer and is stipulated in a contract. For all the Supreme Court's words about contracts and business reality, there is nothing in the decision pointing a solution to this problem.

As things have stood since the Phillips decision, FPC can knock down a producer's firm contract price which had earlier been freely accepted by the buyer and not subsequently questioned by him. This denies to producers the recognition of business reality, legitimate interests, and financial stability which the court accorded to pipelines.

Now Congress, the courts, or FPC should do something to end producers' frustration. And the pipelines should help, now that the Memphis decision has ended their dilemma.

Until producers have some guide as to what sort of price contract will stand, the entire gas industry will lack business reality, financial stability, and protection of legitimate interests.



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What the Memphis Reversal Means

• There'll be a quick jump from gloom to boom. The Supreme Court ruling points to 1959 as a great year in pipeline construction and marks 1958 as just a lean year in a steady building program that's been almost phenomenal.

A YEAR AGO the industry was shocked and incredulous. The "Memphis decision" had plunged the entire gas industry into deep gloom.

The effect of the ruling was immediate. Pipe mills which had been booked solid for 2 years ahead—some into 1962—saw their backlog of orders suddenly evaporate.

Within a month the $182 million Beatrice project—most celebrated casualty of Memphis—was canceled by its backers, Natural Gas Pipeline Co. of America, Colorado Interstate Gas Co., and Pacific Northwest Pipeline Corp. Another company with $100 million in projects pending before the FPC said it couldn't finance them in the face of the decision.

There was a new situation in the booming natural-gas industry.

Contractors who had already negotiated contracts to build Beatrice found themselves with idle equipment early in the construction season. Equipment orders canceled on the eve of delivery left idle mill space; some mills went to part-time operation or were shut down.

Early this year line-pipe shipments dropped to 60% of the comparable 1957 period. Construction generally slumped during the first half.

There was a late-summer pickup in pipe deliveries, and construction began to gather some momentum, but it was obvious that 1958 would go into the records as a poor year.

Last week the Supreme Court overturned the decision.

The prospect of an already busy winter construction season, plus the stimulus of the Supreme Court decision, have now created an optimism as buoyant as the gloom was depressing just a year ago.

Some say the outlook for the growth of natural gas is "phenomenal"; others see a "return to normal." But normal growth in the gas industry in the past decade has been phenomenal compared to some other divisions of the industry.

There is one note of caution: Reversal of the Memphis decision merely solves those problems that the original ruling raised.

Pipelines still must put together gas reserves, obtain market commitments, and get a program through FPC, which often is a 1 to 2-year job.

And new projects will not automatically and immediately materialize. Beatrice, for example, will not be resurrected. Its gas has been thrown to another project. But Beatrice is already being replaced by other projects. Still others which have been on the shelf will now become active.

Industry leaders see better things ahead

"Texas Eastern is pleased because it clarifies the procedure under which transmission companies may obtain rate increases. It will be beneficial in the long run."

Orville Carpenter, president, Texas Eastern Transmission Corp.

"This decision will certainly increase the demand for natural gas."

W. H. Wildes, president, Republic Natural Gas Co.

"The natural-gas industry will resume phenomenal expansion. The decision has the most stabilizing effect on the entire gas industry of any decision to my knowledge in the history of the gas business. The cloud cast over the industry by the poorly reasoned decision of the circuit court of appeals has been cleared away by the Supreme Court."

Paul Kayser, president, El Paso Natural Gas Co.

"We expect an almost immediate effect on construction. Undoubtedly, it will accelerate the 1959 program. Also, it will ease somewhat the securing of financial programs.

"We see the decision as a step toward liberating the gas industry from what could have been a harsh regulation and delay in determining fair prices. Anything that will tend to reduce regulation, particularly in the search for new supplies of gas and oil, will be beneficial to the country as a whole and the industry."

L. V. Favrot, president, Houston Contracting Co.

"The ruling should result in increased demand for line pipe and oil-country goods and should rejuvenate the whole natural-gas industry. Lone Star had many orders for line pipe canceled or postponed as a direct result of the Memphis decision."

E. B. Germany, president, Lone Star Steel Co.

"The reversal of the Memphis decision . . . is a happy decision, as far as the Peoples Gas system is concerned. It will make it possible

All the elements—available gas, market, and freedom and ability to serve the market—point to a big 1959. The long-range picture, which would have been affected most by Memphis, looks good, too.

The opinion . . . The court held in a 5-3 split decision that an interstate pipeline company does not need advance customer approval for a proposed rate increase if a fixed rate had not been specified by contract.

The ruling overthrew the November 1957 decision by the District of Columbia appeals court. The lower court had knocked out a rate increase of some $10,000,000 a year sought by United Gas Pipe Line Co. on grounds that the company did not have prior approval of its customers. Effect of the ruling went far beyond United Gas and the Memphis Light, Gas & Water Division which led the assault against the rate increase.

As a result of the Memphis decision, other pipeline companies faced the threat of having to refund some $225,000,000 in higher rates which had gone into effect pending final ruling by the Federal Power Commission.

Memphis and Mobile . . . Justice John Marshall Harlan wrote the majority decision, pointing out that United Gas had the right "to change its rates as it will, unless it has undertaken by contract not to do so."

It was the same Judge Harlan who previously had written what is known as the "Mobile" opinion. That ruling, handed down in 1956, held that a pipeline's customers must approve rate increases under Section 4 of the Natural Gas Act.

In last week's ruling, the five-man majority found it "apparent that the court of appeals misconceived the import" of the Mobile decision. That case involved a fixed rate, while in the Memphis case charges were to be based on the "going" rate or the rate on file with the FPC "from time to time."

The Memphis-type contract is far more common than the fixed-rate type. There are about 1,100 contracts in effect which follow the "service-type" provisions of United's contract as compared with 18 of the fixed-rate type.

The high court held that there was nothing in the 1956 case to suggest that United Gas in the Memphis dispute was not "entitled to file its new schedules under Section 4(D), or that the commission had no jurisdiction to consider them under Section 4(E)."

In effect, the ruling upheld the procedure which had been followed by the FPC for years. Historically, the commission has required 30-day notice of a proposed rate change. The commission may suspend the rate during that 30-day period, or it may suspend it for as long as 5 months after the scheduled effective date.

If the commission hasn't accepted or rejected the rate at the end of the suspension period, the pipeline may put the new schedule into effect subject to refund in case any or all of the increased rate eventually is disallowed.

The Supreme Court pointed out that Congress had intended the Natural Gas Act not only to protect the public from excessive prices but also to protect the legitimate interests of natural-gas companies. The majority opinion added that the gas-consuming public has a "vital stake" in the financial stability of such companies.

The dissent . . . In a dissenting opinion, Justice William O. Douglas contended that the majority ruling "makes a shambles of the act so far as consumer interests are concerned" and that it "turns the real regulation over to the pipeline companies."

Joining Douglas in the minority view were Chief Justice Earl Warren and Associate Justice Hugo L. Black. Tom Clark did not participate in the ruling.

The effect . . . Soon after the Memphis decision was handed down, the FPC conducted a survey to determine how much pipeline construction was being postponed as a result.

Although the replies were accepted anonymously, it was reported later that a "substantial" part of a $283,000,000 construction program had been delayed. One company alone reportedly cancelled $110,000,000 in equipment orders.

Some pipeline companies spent much time and money during the past year in an effort to obtain customer approval for rate increases to help finance expanded service. In some

Industry leaders see (con't)

to initiate and carry out future natural-gas expansion projects more expeditiously. This now restores traditional procedures of the FPC in regulating rates of interstate pipeline companies.

"The procedure made necessary by the Memphis case ruling slowed down industry expansion. It led to postponement or abandonment of expansion plans that would have been of great service to the public."

Eskil I. Bjork, chairman, Peoples Gas Light & Coke Co.

"The ruling makes it possible for the industry to get rate relief when necessary. It is a healthy thing for the entire industry. This doesn't mean any automatic rate increase but does give the industry an expeditious procedure to follow before FPC. It clears the atmosphere and will be helpful toward expansion and raising money for expansion. The decision does not affect Transco's current operations as it has no rate increase pending."

James B. Henderson, vice president and general counsel, Transcontinental Gas Pipe Line Corp.

"The depressed supply and equipment business should have indirect benefits from the decision. Anything that aids the transmission industry will aid the supplier."

M. E. Montrose, vice president, Hughes Tool Co.

"We are very pleased with the import of the decision. However, we won't know its full effect until it has been studied."

Ed Parkes, president, United Gas Pipe Line Co.

"It should be very beneficial. It's one of the nicest Christmas presents we could get. What happened to the stock market speaks well. Certainly the ruling is in line with good thinking."

O. R. Burden, O. R. Burden Construction Corp.

"As we look at it, it definitely is a shot in the arm for the pipeline-construction industry. The stock-

cases, they found distribution companies were almost unanimously in favor of higher rates if they meant more gas for their customers.

Even some of the companies that had little or no rate increases subject to refund found it difficult to borrow money at favorable rates to finance expansion of their systems.

While waiting for a review of the case by the Supreme Court, the FPC refused to apply the Memphis principle to other rate cases pending approval. Even United Gas was not required to comply with the ruling immediately because the lower court had not handed down a mandate.

Optimism returns . . . The stock market responded immediately to the Supreme Court ruling.

Common stock of some of the major transmission companies jumped from 3 to 4 points a share within hours.

Major producers of gas also shared the boomlet, and one pipe manufacturer saw the possibility of pipe sales' doubling within months.

Other industry suppliers were more cautious, pointing out that the situation merely returns to normal. And that means an opportunity to finance and file with FPC expansion programs to serve growing markets without the interference caused by the Memphis decision.

The essence of industry reaction was that the ruling removes real and psychological barriers to growth and permits orderly planning.

market reaction is indicative of expansion in a big way. We feel sure that FPC will approve a lot of new construction. We are more optimistic now than in a long time. A big barrier to future expansion has been removed."

T. J. Behrenfeld, sales manager, M. J. Crose Manufacturing Co.

"There's no question that the decision will be favorable to the gas-equipment industry. It will go a long way in giving confidence to the pipeline industry when it comes to expansion."

L. B. Smith, president, A. O. Smith Corp.

Transwestern Before FPC

. . . examiner this week. El Paso Natural is expected to oppose Texas-to-California line since it will be moving into an area now served solely by El Paso.

A BATTLE for future gas markets in booming California will open in Washington this week before a Federal Power Commission examiner.

A newcomer, Transwestern Pipeline Co., will be trying to elbow its way into a fast-growing interstate market now served exclusively by an oldtimer, El Paso Natural Gas Co. Hearings are scheduled to start at 10 a.m. December 15 before FPC Examiner Emery J. Woodall.

El Paso, which would face competition from the new company in buying as well as selling gas, is expected to spearhead the opposition to Transwestern's application for a permit. El Paso filed a petition to intervene in the case last June shortly after Transwestern submitted plans for its Texas-to-California pipeline.

Although El Paso is expected to object vigorously to the proposed competition, Transwestern's threatened entry into the California market may prove a blessing of sorts to El Paso in defending its marketing area.

Transwestern arrived on the scene in mid-1957, about the time antitrust charges were filed against El Paso to block its merger with Pacific Northwest Pipeline Corp. Chief complaint against the merger is that it threatens to give El Paso a monopoly along part of the West Coast.

El Paso is now the sole supplier of out-of-state gas to California. Once self-sufficient in gas, California now gets about 70% of its supply from other states. It is one of the fastest-growing markets in the country.

Prices . . . Competition from Transwestern was felt by El Paso long before the new company filed for an FPC permit.

Transwestern contracted for its gas supply, now estimated at 2.8 trillion cubic feet, principally in West Texas, the panhandle region of Texas and Oklahoma, and the San Juan basin of New Mexico. These are the same areas where El Paso buys most of its gas.

In some instances, field prices reportedly jumped several cents per M.c.f. where both companies were competing for reserves.

An FPC official said Transwestern contracts call for a price of 17 cents per M.c.f. In the San Juan basin, 12 to 21.8 cents in the Permian basin, and 23 cents in the Panhandle.

Transwestern's main line would include 670 miles of 30-in. pipe stretching from a point near Roswell, N. M., to the Arizona-California border near Topock, Ariz. Plans also call for a 252-mile supply lateral from Puckett field in Pecos County, Texas, and a 298-mile line from the Texas Panhandle to the origin of the main line.

The $189,798,000 system would have a design capacity of 300,000 to 350,000 M.c.f. per day. Capacity could be increased to 640,000 M.c.f. daily by adding compressor facilities.

Transwestern was organized by Monterey Oil Co., Los Angeles; W. K. Warren, Tulsa, chairman of Warren Petroleum Corp., and J. R. Butler, Houston.

Japanese Launch

the world's biggest tanker. It'll start work January 31.

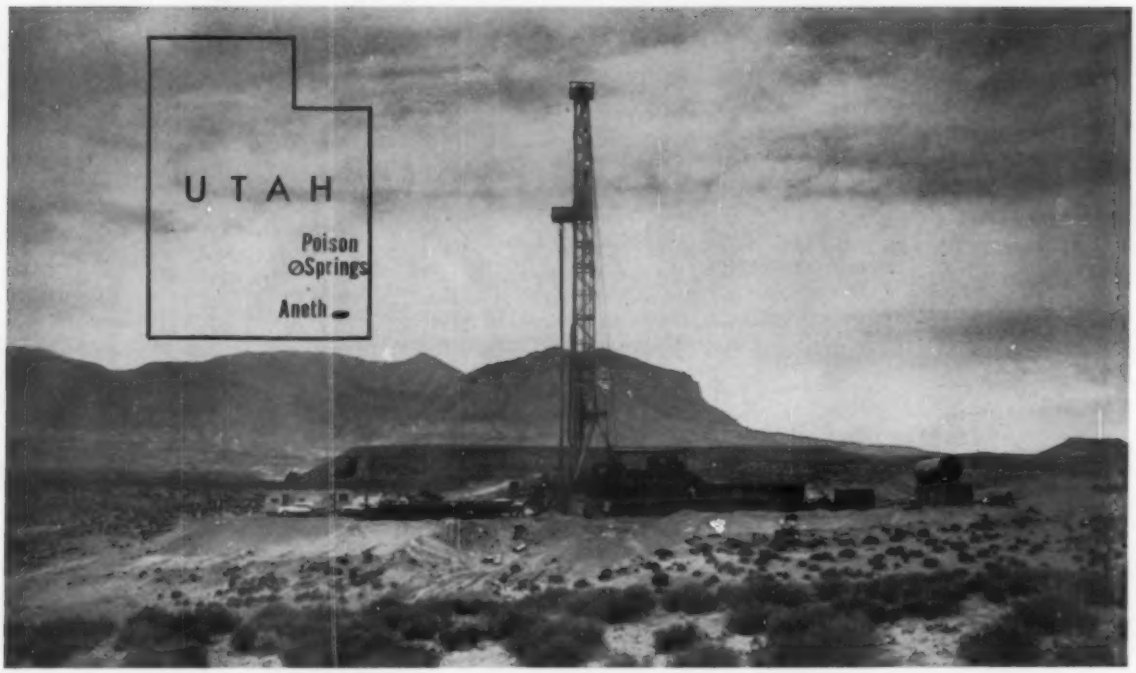
THE 104,500-ton Universe Apollo took over title as the world's biggest tanker at its launching last week at the Kure yards of the Japanese Navy.

The vessel has a load capacity of 773,300 bbl. of crude oil in a single cargo. It is scheduled to start service January 31, carrying crude from Kuwait to Japan for the Mitsubishi Oil Co.

The Universe Apollo is owned by National Bulk Carriers, Inc., New York, a D. B. Ludwig enterprise. Her dimensions are 950-ft. length, 135-ft. beam, and 67½-ft. depth. She is powered by turbines capable of developing 27,500 hp. and will have a service speed of 16 knots.

The Universe Apollo is the first of a series of five sisterships, all scheduled to be built at Kure. Not only is it the largest tanker but also the biggest commercial ship ever launched. Another record was set in speed of her building. She is due to be commissioned just 7 months after keel laying.

As mammoth as she is, the Universe Apollo will be topped by two ships on order but not yet under construction in the U. S. They are the 106,500-dwt. vessels ordered by Aristotle Onassis and Stavros Niarchos interests.



Utah Reef Discovery Stirs Industry

• TGT wildcat is no commercial find, but company is enthusiastic about possibilities. Geologists cite characteristics similar to formations of both Scurry and Leduc fields.

THE DISCOVERY of a reef on the west flank of Paradox basin has brought tense anticipation to the oil industry.

Geologists and oil men wondered aloud at the significance of the discovery. The possibilities are intriguing.

But there's one sobering fact: No one has yet found oil in quantity on the Paradox west flank.

Tennessee Gas Transmission Co., whose wildcat has caused the flare of interest, has made it plain it has no discovery well. The company said tests yielded both oil and water, and apparently the well did not penetrate the reef at the point most favorable for commercial production.

The well which discovered the biohermal reef is the TGT 1 U.S.A. Poison Springs, Section 4-31s-12e, Garfield County, Utah.

The reef is 110 ft. thick, from 4,900 to 5,010 ft. Oil staining was found in the top 70 ft. Core analysis indicates good porosity and permeability throughout the entire reef.

Important shows also were made farther uphole, but there is nothing yet in commercial quantity.

The reef zone is in the Pennsylvanian, and drilling has since gone to the Devonian at a total depth of 6,486 ft.

Looks promising . . . A TGT geologist says the well, in his company's opinion, "opens up the possibility of another major oil producing province."

This feeling is based on the type of reservoir found in the reef, the recovery of free oil from the Pennsylvanian sands above the reef, and the rather shallow drilling depth.

"It would certainly indicate an economic and not too expensive operation," he said.

On the debit side, however, the geologist pointed to the remoteness of the area and the difficulties of communication and transportation.

The Poison Springs well is about 12 miles south of the small town of Hanksville and about 70 miles south of Green River.

Other activity . . . TGT has a second well drilling in the area, and five other companies are sinking wildcats there (see p. 151).

Within the next few weeks the industry should know considerably more about the potentialities of the west flank and whether southeastern Utah could spawn another development that will rival Aneth and others in the basin.

The second TGT well is 7 miles north of the Poison Springs well. It's TGT 1 U.S.A. Sorrel Butter, Section 33-29s-12e, in Wayne County. Currently it's below 3,600 ft. and headed for the Pennsylvanian and Devonian.

Other companies with leases in the area include Standard Oil Co. of California, Carter Oil Co., Richfield Oil Corp., Texas Pacific Coal & Oil Co., Sinclair Oil & Gas Co., and British-American Oil Producing Co.

Oil shows . . . The Poison Springs well found not only the biohermal reef but also got oil shows higher in the hole.

Pipe was run to 5,050 ft., and a drill-stem test of 1½ hours recovered 160 ft. of 39°-gravity oil at 4,164-94 ft. There were other shows in samples from 4,310-4,676 ft., and testing continues.

While TGT doesn't want to go overboard in its discussion of the reef find, its geologists do not hesitate to mention Scurry and Leduc in the same breath.

Both Scurry in Texas and Leduc

in Canada are reefs, and with these in mind, the TGT geologists are saying: "We have oil stains in a type of development identical to these big prolific oil fields."

The Pennsylvanian formations are the same age as those of West Texas' Scurry. Canada's Leduc is in the older Devonian. "But they all have similar characteristics."

Aneth and other Paradox basin fields to the east of the Poison Springs well are reefoid in nature but are not considered by geologists generally as true biohermal reefs.

Much of eastern Garfield and Wayne counties, which abut San Juan County on the west, is in the "hot" area of current exploration. Part of southeastern Emery County, just to the north of Wayne, also is included.

In the weeks ahead, the industry will be watching this region in the hope that the U. S. has another great oil province.

Settlement Nears

in CIG rate dispute. Only rebate amount undecided.

A SETTLEMENT seemed nearer last week in the prolonged dispute over Colorado Interstate Gas Co.'s natural-gas rates.

All side issues in the case have been settled, according to Arthur Kline, acting chairman of the Federal Power Commission. The amount of rebate is the main issue still under discussion, he said.

Some FPC staff members are aiding in efforts aimed at a compromise settlement which then would be submitted to the full commission for approval.

Details of the arbitration have not been disclosed. But according to reliable sources, it is being suggested that three of four pending rate-increase cases be settled by an agreement under which the Colorado Springs transmission firm would refund about $40 million for overcharges dating back to January 1, 1954.

The total amount of these increased charges, all subject to refund, is now $85 million.

The $40-million refund would be about $8 million higher than a previous settlement offer made by Colorado Interstate. However, it is $10 million lower than the refund sought by Colorado Public Service Co., principal retail distributor in the Denver area, and by the city of Denver which intervened in the case in behalf of urban consumers.

Gas Export Requests Revised

. . . by Westcoast, Alberta & Southern. Two firms would move 625,000 M.c.f. of Alberta gas daily to U. S.

TWO GAS EXPORT companies, Alberta & Southern Gas Co., Ltd., and Westcoast Transmission Co., Ltd., have filed revised applications for permission to transport surplus Alberta gas to the U. S.

The separate applications were filed with the Alberta Oil and Gas Conservation Board in line with its report made last September (OGJ, Sept. 22, p. 59).

That report suggested the two companies revise original applications downward. At that time, there was not sufficient surplus of Alberta gas to meet their demands.

New proposal . . . If the companies are successful in their applications, they propose to build jointly a 36-in. pipeline running 105 miles from the Alberta-British Columbia border to the British Columbia-Idaho border (OGJ, Oct. 20, p. 48). This line would feed the transmission lines of both in the U. S.

Alberta & Southern now seeks 460 million cubic feet of gas daily or 4.9 trillion cubic feet over a 25-year period.

Westcoast's new application requests 165 million cubic feet daily or 1 trillion over a 22 to 23-year period. This is a decrease of 5 million cubic feet daily from the original plan.

J. K. Horton, president of Alberta & Southern, said "the conservation board's September report indicates gas from certain fields is surplus to the needs of Alberta and Canada, and we have adjusted our application accordingly.

"Because of recent discoveries and certain additional contracts, it has not been necessary for us to reduce the scope of our project."

Supplies grow . . . The highlight of the amended application is the disclosure that a portion of the gas reserves in the recently discovered Berland River field is committed to Alberta & Southern.

Early indications, based on the discovery well, suggest this may be one of the largest gas fields yet found in Canada.

Another major new source of supply for Alberta & Southern will be the Whitecourt area, where Beaver Creek, Pine Creek, and Windfall fields have been placed under firm contract and estimated reserves materially increased.

Horton reported that arrangements are being made to release certain quantities of gas to Trans-Canada Pipe Lines, Ltd., in conformity with the board's schedule of Canadian requirements.

Free for the asking:

The Journal Index

The Oil and Gas Journal's index of stories and articles printed during 1958 will be ready for distribution the first part of January. It's free to Journal subscribers.

If you want a copy, send a postcard to The Reader Service Department, The Oil and Gas Journal, Box 1260, Tulsa, Okla. The index will be mailed just as soon as it's printed.

Crude Cuts Posted

by Shell on Oklahoma sweet and Pure in Denver basin.

SHELL Oil Co. gave new support to a $3.08 per barrel top price for Oklahoma sweet crude last week, when it posted a new schedule calling for a 7-cent cut.

Shell is the last major buyer in the state to move off the old $3.15 top price in Oklahoma. Shell buys about 15,000 bbl. daily in the state.

Oklahoma currently has a double price schedule. Shell joins Sunray, Sohio, Rock Island, Cities Service, Phillips, Continental, and Indiana Oil Purchasing with postings calling for the $3.08 top. Anderson-Prichard, Kerr-McGee, Midland Cooperative, Champlin, Magnolia, and Sinclair post a $3.05 top.

Meanwhile, there was no immediate reaction to a 5-cent cut for Denver basin crude posted early in the month by Pure Oil Co.

Pure's new schedule set a top of $2.93 a barrel for oil of 40° to 44.9° gravity. Pure, largest producer in the basin and also a major buyer, said the cut was designed to place crude prices in that area on a competitive basis with alternative supplies. The new schedule affects from 35,000 to 40,000 bbl. daily in Colorado, Wyoming, and Nebraska.

In another reduction last week, The Texas Co. reduced its Kansas postings 10 cents a barrel to a $3.05 top for 17,000 bbl. daily.

Fewer Wells Mean More Profit

• That's the sermon some Texans are preaching today. They hope to bring the entire industry to this point of view through the new conservation forum.

THE TEXAS independent is stepping forward to lead the battle for wider well spacing—and more profits.

This development, while surprising to some, has given real impetus to the newly organized Oil Industry Conservation Forum.

In recent weeks a number of independents have turned the spotlight on themselves and reached the conclusion that a change in their own outlook toward well spacing may be their salvation.

The crux of their argument is this: With wider spacing, there would be greater allowables per well. This means greater income per well and more money to invest in wildcats to find new reserves.

The potent voice of the independent in the organization of the OCIF is being heard in Texas. In Houston last week, two well-known independents urged wider spacing. They are Johnny Mitchell of Christie, Mitchell & Mitchell Co., and Harold Decker of Highland Oil Co.

What Mitchell said . . .

Independents who hold out against cooperative development of fields were sharply criticized by Mitchell.

"For us to survive," Mitchell said with candor, "we've got to be unselfish."

Mitchell was speaking at a meeting of the Houston chapter of the Texas Independent Producers and Royalty Owners Association. He is chairman of TIPRO's District 2.

While not advocating compulsory unitization, Mitchell said he does favor a "code of ethics" for the independent to follow. He pointed specifically to the haphazard development of Pierce Junction field at Houston, where new deep pay recently brought heavy drilling on small parcels of land.

Mitchell later elaborated on his remarks and offered his version of what the industry should do to halt the unnecessary drilling of wells. His proposal: Let acreage alone be the yardstick for setting allowables and granting drilling permits.

The practice of setting base allowables for wells is wrong because it results in unneeded wells, in Mitchell's opinion.

"The law of capture is the basis for such a regulation," Mitchell said. "And as long as there is an application of the law of capture there will be waste. Waste will mean higher prices for oil and gas and their products. And unnecessary wells will continue to be drilled. We have to face this single fact or face extinction."

Mitchell did some plain talking in turning the spotlight on the small operator.

"There is no excuse for a man, simply because he is small, being permitted to abuse his neighbors," Mitchell said. "I say that anyone who drills on less acreage than is necessary is guilty of abusing his neighbors. But more than that, he is guilty of keeping the price of oil high and eliminating or reducing domestic exploration . . ."

To explain his basic theory, Mitchell said that "it is only right that a landowner should recover only what oil and gas he owned prior to the migration of oil and gas caused by man." For this reason the acreage yardstick should be used in setting allocations and in drilling wells.

In some places, he said, 1-acre gas wells are being drilled where one well will drain 640 acres. It is economically impossible to produce enough gas from 1 acre to pay for the well, but the practice continues under present regulations.

"Independents, who drill 75% of our domestic wells, should dedicate themselves to the proposition of urging and then cooperating with regulatory bodies to bring about equitable—and by that I mean wider—spacing," Mitchell said.

Decker's views . . .

Decker is promoting wider spacing through his position as chairman of the OCIF's subcommittee for the Texas region. As subcommittee chairman, he is urging his fellow independents to participate in the Forum's program.

He will have 18 members of his subcommittee to study wider spacing and recommend a program to the full steering committee.

Of the 18 members, Decker expects 15 of them to be independents. And 12 of the 15 will be members of TIPRO.

While Decker is not yet stating his views as to how wider spacing can be accomplished, he agrees with Mitchell that something must be done.

Decker's position is that the industry must get together on a program it can present to regulatory bodies. Only in this way can it hope to get action. This, he said, is the reason the Forum must get a strong body of industry opinion behind it.

Decker cited six fundamentals which should guide the Texas committee in its studies:

. . . **Rules and regulations** govern-

Johnny Mitchell
. . . "we've got to be unselfish."

Harold Decker
. . . "we've got to be efficient."

ing present oil and gas fields should not be changed. Changes should apply to future fields.

...There need be no change in the conservation laws of Texas. This would lead to unnecessary controversy. Changes in regulations or policies of the Railroad Commission will do the job for now.

...The subcommittee should study thoroughly the authority which the Railroad Commission now holds in regulating drilling and production.

...The subcommittee should cooperate with the Railroad Commission in seeking aid and advice in its study.

...Any recommendations of the subcommittee should be for the benefit of the entire industry—not for one group within the industry.

...While the industry hopes for rapid progress in settling the well-spacing issue, there can be no hasty decisions. Much study is needed.

Decker made the further point that drilling contractors should go along with wider spacing because of the long-term benefits.

Summing it up, he said: "I believe this Forum will show the independents and majors that we can make more profits per dollar spent—which is what we are after. We are going to have imports, and we have to live with them. We have got to be more efficient, producing more oil with the wells we drill."

Others named . . . Meanwhile, the OICF has announced that chairmen of five regional subcommittees have been appointed.

In addition to Decker, who heads the Texas subcommittee, those named are James E. Low, Amerada Petroleum Corp., Tulsa, for the New Mexico-Arizona region; Herbert Hunt, Hunt Oil Co., Dallas, Rocky Mountain region; A. E. Chester, Magnolia Petroleum Co., Dallas, Louisiana-Mississippi-Arkansas-Alabama region; and L. E. Fitzjarrald, Phillips Petroleum Co., Bartlesville, Oklahoma-Kansas region.

Conoco to Drill on Movie Lot

METRO-Goldwyn-Mayer and Continental Oil Co. have signed an agreement for drilling on the studio's 180-acre Culver City film lot. This makes MGM the third major picture maker in Los Angeles to get into the oil business on its own studio property.

Union Oil Co. of California has the Paramount Pictures lot in Hollywood under lease, while Universal Consolidated Oil Co. has production at the 20th Century Fox lot in West Los Angeles. Union drilled a dry hole on the Paramount property last summer.

watching WASHINGTON

Joe Reilly

• Shifts in Congress dim gas-bill chances . . .

IT'S GENERALLY AGREED that there's slim chance of getting legislation through Congress this year to free independent natural-gas producers from federal price controls. The chances seem to be getting slimmer all the time.

A detailed summary of last month's election results as they relate to oil and gas legislation has been prepared by Frank W. Rogers, Washington representative for the Western Oil and Gas Association.

Rogers pointed out that the Harris-Fulbright bill has lost far more support than opposition in each of the last two congressional elections.

The bill passed the House by a vote of 209-203 in 1955. Since then, 71 representatives who supported the bill have died, retired, or failed to be reelected. The new House, however, will include all but 46 who voted against the bill.

In the new Senate, the shift in sentiment won't be quite so pronounced. There are 42 holdover or reelected senators who either voted for the gas bill or indicated they were in favor of it and 27 who opposed it. But of the 16 new senators, 8 were on record against the bill in the lower house.

• Synthetic-rubber use gained 37% in October . . .

THE SYNTHETIC-RUBBER industry may pull out of its slump sooner than had been expected.

Monthly reports issued by the Department of Commerce show U. S. consumption of synthetic rubber has been rising steadily since July. The department estimated this year's peak consumption at 88,015 long tons in October, latest month for which figures are available.

The October figure represents a gain of about 37% from the July low. Consumption during the first 10 months of this year was still running nearly 10% below a year ago, but the 10-month total exceeds consumption for the entire year as recently as 1954. If the third-quarter trend continues, consumption this year may be second only to the 1957 peak.

Production has climbed back to more than 100,000 long tons per month as compared to a low of about 73,000 in April. Because of the cutback in production earlier in the year, stocks have been reduced to the year's low and are now about 10% lower than at the end of last year.

• FPC to hear Chicago gas service proposals . . .

THE FPC is moving fast to settle the big free-for-all over expansion of gas service in the Chicago area.

The fight will resume this week when hearings start on Midwestern Gas Transmission's new proposal to supply long-neglected markets there. The first round of the fight featured 20 contestants and lasted more than 3 years. The second round may be equally bitter. But it should be much shorter.

Midwestern's new plan calls for construction of about 350 miles of 30-in. pipeline to move gas from the Tennessee Gas Transmission system near Portland, Tenn. TGT, parent firm of Midwestern, plans to lay about 158 miles of 36-in. loops along its main line in Louisiana and Mississippi to supply the additional gas. The combined projects would cost about $112,000,000.

Midwestern and Tennessee filed their applications November 4, just a few days after the FPC rejected their proposal to move both Canadian and U. S. gas to Midwest markets. The FPC has indicated it will act quickly on the new proposals, along with others due to be filed by competitors.

LACT Is for Stripper Leases, Too

• Study shows savings would be made by eliminating vapor losses which cost the producer both volume and gravity. Prospect is best where small leases can be unitized and production delivered to a central LACT unit.

IT HAS BEEN the big leases and the new flush pools which have received all the play from lease automatic custody trans (LACT) since it was introduced 3 years ago.

The general belief has been that equipment to transfer crude automatically from producer to pipeline was not economical without at least 200 to 500 bbl. of daily production.

The small lease has been considered outside the economic scope of automation, and has been expected to remain so until costs are reduced considerably. Perhaps it would never be automated.

Now a new look at known facts and availability of newly designed small systems indicate something quite different: that LACT, using meter or meter-tank measurement, can be economically installed on leases much smaller than 200 bbl. The prospect is particularly good where it is possible to unitize small leases in settled production areas and deliver oil to a central LACT unit.

Feasibility has been proved on leases in Oklahoma and Texas. Here's what can be expected on many leases:

. . . For the producer, as much as 5 to 7% volume increase and an API gravity increase due to conservation of vapors in closed-system operation. There would be increased revenue from higher output, since many such fields aren't prorated, and there would be price improvement for the upgraded crude.

. . . For the pipeline, lower gaging and maintenance costs, as well as vapor savings.

The stripper lease appears to have been overlooked amid all the emphasis on obvious savings in tank investment on large leases. However, LACT now looks feasible on a good many scattered old leases where volume and gravity increases may be obtained. And it may be the means of saving leases which are of marginal profitability to the producer and a liability to the pipeline.

What can be done . . . Take a hypothetical 100-bbl. pool in an old Oklahoma producing area where there are 10 leases.

Because of the low production rate, oil weathers 15 to 30 or more days while tanks are filled. If oil were tested at the wellhead, leases within the same pool would of course have the same gravity. But because of varying vapor losses, gravities in this pool vary several degrees at the point oil is sold.

Indications are that at least 2° weighted average gravity improvement would be obtained if oil were handled in a closed system. This would mean a volume increase of 5%, using the rule of thumb of a 2½% volume change for each degree of gravity. (Limited experience indicates this result, but more study is needed before it's known how all pools and all crudes behave.)

The resulting volume increase would be 5 bbl. per day, and the gravity increase would mean 4 cents more per barrel for all oil sold from the pool. At $3.03 per barrel, 100 bbl. would bring revenue of $303 per day. With 105 bbl. selling at $3.07, revenue would be $322.35. This amounts to $19.35 more per day and $7,062.75 per year before taxes, which in many cases would halve the amount.

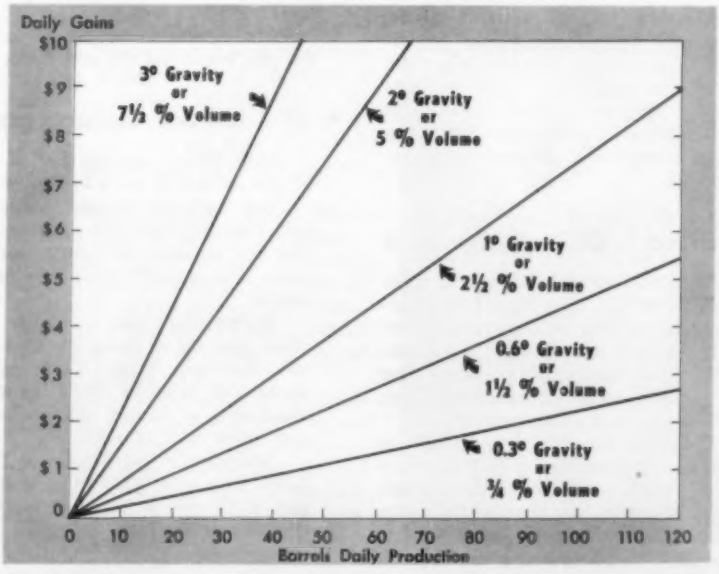
A newly designed LACT system now available for small leases is priced at about $5,500 in Tulsa. This is complete with monitor, temperature and pressure recorder, control panel, allowable counter, and accumulative

How to Figure Dollar Gains Through Vapor Savings

EVAPORATION of light ends at a lease battery can mount up fast.

This chart, based on a study made by Murdock Tank & Manufacturing Co., shows how to figure vapor savings on a dollar basis. The chart is based on the rule of thumb that a change of 1° gravity equals 2½% of volume. And the curves are based on crude selling at $3 a barrel.

For example, the loss on a 40-bbl. daily lease is $9 if the crude loses 3° gravity or 7½% volume while in storage. In a study Murdock made using figures from a major crude line, the company found crude in storage was losing 2.7° gravity or 6½% volume in one pool. Converted into dollars, the loss hit $3.90 a day for a 20-bbl. lease and $9.75 for a 50-bbl. lease.



dump counter. It does not include hookup piping and field installation.

Model unit operation . . . What may be a model for future unitized leases delivering to a single LACT unit is operating in West Texas.

A 1-bbl. automatic dump-type meter with core barrel sampler is placed on flow lines from each lease at a cost of $1,300. It accurately measures oil and water into a central treating system and replaces the battery and treating unit at the lease. From the treating plant all oil is monitored and delivered automatically to the pipeline gathering system. Thus vapor loss is almost eliminated.

Converting to LACT . . . In many old producing areas it seems logical to convert existing gathering systems into flow lines from leases to central treating plants.

Most pipelines would probably be willing to sell this pipe in place at a price attractive to the producer in return for the advantage of receiving oil automatically. One suggested formula for a sale price: the going rate for second-hand pipe less what it would cost the pipeline to take up, recondition, and rack the pipe for use elsewhere. Other bases include net book value, net salvage value, 65% of the current price of equivalent new pipe, and trading pipe in the ground for the same footage of good used pipe of like grade.

The pipeline would gain obvious savings in gaging and maintenance. It would also profit from conservation because the loss in 24-hour weathering and emptying of field tanks is minimized in automatic operation. A crude pipeline system might expect to save 0.2% of the volume tendered by such LACT units.

The conversion of old leases to unitized operation with production treated and measured at a central point may be an approach which will be used to automate small leases. It may prevent abandonment of marginal operations by making available to small leases the automation benefits which up to now have been enjoyed primarily in larger and newer fields.

Besides benefits from automatic unattended custody transfer, there is much to be gained from centralized treating and separation of oil and gas and salt water. The investment in lease tanks, treaters, and oil and gas separators will be lower. There are further advantages in pipeline companies' receiving gas and oil at central points and in producers receiving salt water at a central point for water flooding.

Offshore Bonus Rule Attacked

. . . by new California official. Cranston wants all leases awarded strictly on the basis of highest royalty bids.

THE CALIFORNIA legislature may be asked to abolish the cash bonus option in the new rules for awarding state-owned tideland leases.

Alan Cranston, state controller-elect, said he will ask the lawmakers to change the rules so that parcels would be awarded only on the basis of the highest royalty offered.

As the new controller, Cranston automatically becomes a member of the three-man State Lands Commission which handles offshore leasing for the state.

Cranston said that "the state is settling for a fast buck, the bonus, and thereby is losing much greater long-range income. Companies which are on state leases starting at 16⅔% royalties are drilling in Saudi Arabia and paying 50% and up."

The rules . . . If Cranston has his way, operators would be faced with their third set of rules since the state's tidelands were opened up 3 years ago.

The original Cunningham-Shell Act of 1955 called for cash bonus plus a fixed 12½% royalty on wildcat parcels, and cash bonus plus a sliding-scale royalty beginning at 16⅔% on proven parcels.

Only two parcels were awarded under these rules. One was a 5,500-acre wildcat parcel at Summerland which went for a joint cash bonus bid of $7,250,000 to Standard Oil Co. of California and Humble Oil & Refining Co. The other, on a known producing structure, was a 500-acre block taken by Tidewater Oil Co. for a $75,000 cash bonus.

In 1957, the legislature changed the rules to cash bonus plus sliding-scale royalty beginning at 16⅔%, or bidding strictly on the basis of highest royalty offered.

Five parcels have been awarded under these rules, all on a cash bonus basis (OGJ, July 7, p. 72). The parcels attracted a record of $55 million in cash bonuses.

New Treating Chemical Needed

. . . where heavy brines are used for flooding. Problem will worsen as floods increase and water becomes more scarce.

THERE'S a growing need for a chemical for treating heavy brines used in water flooding. Six million pounds of bactericides were used last year to control microorganisms in water floods. Effectiveness of many compounds, however, is diminished when used in floods employing heavy brines, Dr. Arnold Lada, Onyx Oil & Chemical Co., told the Chemical Specialties Manufacturers Association meeting in New York.

The culprits which challenge work of control chemicals are sulfate reducers. These microscopic germ-like cells multiply rapidly. They induce corrosion by removing accumulated hydrogen in cathodic areas on the metal surface.

They form hydrogen sulfide which can precipitate insoluable iron sulfide. This plugs formations and cuts water-injection rates, two major water-flooding headaches.

The problem is ballooning as water floods grow in number. Between 2 and 3 million barrels of water was required last year to produce 190 million barrels of water-flood crude. By 1980 annual water-flood production may reach 750 million barrels.

As water requirements mount, availability of good water supplies diminishes, Dr. Lade said. Poorer quality water, more susceptible to organism growth, can be expected.

No single bactericide is effective against all organisms commonly found in water flooding. Costs limit the volume of chemicals used.

Currently used in water treatment are quaternary ammonium compounds, imidazolines, phenolics, fatty amines, amine derivatives, and organic mercurials. Chlorine, copper sulfate, and hypochlorites also are used, particularly in open-type water systems. The quaternaries, imidazolines, amines, and amine derivatives hold most interest.

Sulfate reducers multiply so fast the normal residual concentration of chlorine does not inhibit their growth. Use of higher concentrations might stimulate corrosion. Formaldehyde at 30 p.p.m. reportedly does not control sulfate reducers and other bacteria associated with flooding.

HIGH, dry, lonesome, and hard to get to.

Good Well But a Big Problem

. . . is this producer in Garrison Reservoir. Ice, mud, and water tripled its cost, and there's still more to be done.

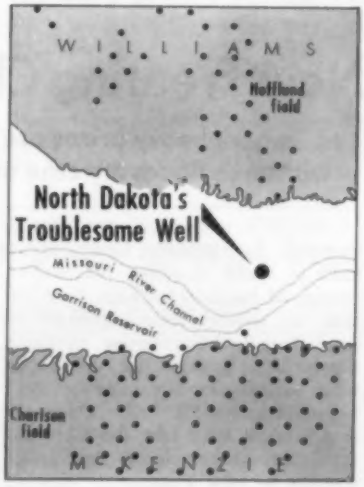
A FIRM with a well in North Dakota's Garrison reservoir has had troubles offshore operators never dreamed of.

In fact, officials of Investors Oil, Inc., could just about write a book on obstacles they've overcome since spudding the 1 USA in February 1957.

When the well was started, there wasn't a drop of water in sight. True, the site was on the Missouri River flood plains. And the Garrison Dam 100 miles downstream some day would impound water at a depth of 58 ft. over the drill site.

But, says Dois D. Dallas, Williston consultant who has shared the well's problems, water wasn't supposed to flood the site for at least 5 years.

So, Investors decided to drill the well at ground level. If it became a commercial producer, there would be plenty of time to build a mound and elevate the christmas tree.


W I L L I A M S
Hoffland field
North Dakota's Troublesome Well
Missouri River Channel
Garrison Reservoir
Charlson field
M c K E N Z I E

Troubles start . . . Battling mud at times, the operators used a tractor to move equipment in the area. Several times a second unit was brought in to get the first one out of the mud.

After several delays, an interval between 8,322 ft. and 8,352 ft. was perforated, acidized, and tested. The well was capable of producing 110 bbl. of oil daily.

Before treating and storage facilities could be completed 1¼ miles north—out of the flood area—the Garrison pool level began approaching 1,792 ft.—the elevation of the well site. This was in June 1957—several years ahead of schedule.

By the end of August there was 14 ft. of water over the 1 USA. A small tugboat was moved to the site to pump oil from the test tanks to the main flow line. During that summer and fall, the well was kept in production with the use of "skin diving" equipment.

In November 1957, Dallas donned the skin diving gear and went under a thin layer of ice to close the master valve and disconnect the flow line. To protect the christmas tree from ice movement, the wellhead was buried under a mound of gravel transported by barge.

The following February, gravel trucks moved out over the ice to build up the mound. This operation was called off after trucks fell partially through the ice.

Work on the mound was held up until a barge could be moved in after the spring thaw. Equipment also was moved by barge to uncover the well, kill it, perforate the main pay, acidize, and elevate the christmas tree.

But movement by barge also faces a threat—if the level of the lake drops lower than 4 ft. at the well site, the barge can't operate.

The well already has cost more than $300,000—enough to complete three wells on dry land. And there are still two periods each year when it's impossible to reach the mound. That's in the spring and fall when the ice is too thin to support vehicles and too thick to break with boats.

Gas Field Opened

in sparsely explored area near Texas-Mexican border.

A NEW GAS field is being opened at a remote location in the sparsely explored northwestern part of Southwest Texas' Webb County.

The discovery well, drilled by Copana Oil Co., is 35 miles northwest of Laredo on the Mexican border and about the same distance from the nearest other production of any kind.

Production is from the Lower Cretaceous-Edwards lime. It is the first from that deeper horizon in Webb County and the most southwesterly in the state.

The wildcat is on a direct line with the "deep Edwards" trend of fields extending from Karnes, Live Oak, and Atascosa counties on the northeast through McMullen and LaSalle counties on the southwest. Stuart City field is nearest production.

The new well, 1 Desiderio Trevino, in the vast Joaquin Galan Grant, is rated good for 2,600,000 cu. ft. of gas daily on open flow. Gas is dry. Flowing pressure through ⅞-in. choke with volume at 1,477,000 cu. ft. daily was 1,729 psi. Flow is shut in with pressure at 2,346 psi. The pay is perforated at 8,970-9,014 ft.

Previous production in Webb County has been restricted mainly to the eastern half following a northeast-southwest trend along the old Mirando shoreline. There, the stratigraphically deepest production is from the Eocene-Wilcox sand.

Peter B. Bike

Merle F. Blakely

New Editors on Journal Staff

PETER B. Bike has joined the exploration department of The Oil and Gas Journal as geophysical editor, and Merle F. Blakely has joined the Tulsa news department as a district editor.

Bike has been a geologist and geophysicist for several oil companies. For 2 years prior to joining the Journal he was division development geophysicist for Seaboard Oil Co. in Dallas and Ardmore, Okla.

He has held similar jobs with Pure Oil Co., Graybol Oil Corp., both in Tulsa, and Frankfort Oil Co., Bartlesville.

Bike is a 1950 graduate in geology from the Colorado School of Mines.

Blakely is a veteran of 13 years in newspaper work and 18 years in public relations.

He has been political reporter, magazine writer and editor, author of radio, television, and movie scripts in addition to his general public relations work.

Blakely served on the public relations staff of Public Service Co. of Oklahoma for 5 years and with the public relations department of Carter Oil Co. for 13 years, in Tulsa and Billings, Mont.

He was educated at Grinnell College, Iowa, and the University of Oklahoma.

Triple Pumper

planned in Texas. Regular equipment would be used.

WHAT IS BELIEVED to be the industry's first triple pumper may soon be installed in Texas.

Richard S. Anderson, Midland, Tex., independent, has asked the Texas Railroad Commission to approve triple completion of three oil zones in his 1 Skelly-Stoker "B" in the Rocker "A" fields area of Garza County, West Texas.

The well now produces from the San Andres through perforations at 2,458-2,502 ft. and from the Clearfork in open hole at 3,242-47 ft. Anderson wants to perforate the Glorieta zone at 3,027-48 ft. and 3,072-91 ft. and produce that zone too.

Each zone would be pumped. Paul A. Drickey, chief geologist for Anderson, said the zones would be pumped through 2-in. tubing, 1-in. tubing, and a string of hollow sucker rods run side by side in 5½-in. production casing.

A Baker Model D permanent production packer would separate the middle and lower zones and a Knowlton gas-vent hookwall packer the upper and middle zones. The three pumps would operate on the one string of rods.

The installation was designed by Fluid Packed Pump Co. J. A. St. John, manager of the technical design section of this firm, told the commission no new type of equipment is involved. More conventional equipment, he said, was added to that generally used in dual completions.

the JOURNAL *said* . . . . . .

50 *years ago*

December 20, 1908

Natural gas for fuel and lighting was turned into the mains at Texarkana, Tex., November 27, and is furnished consumers at a rate of 27½ cents a thousand for domestic purposes and 10 cents per thousand for public utilities and manufacturing plants.

The Secretary of the Interior has withdrawn from entry all the public lands in the important petroleum and natural gas field in northwestern Louisiana, known as the Caddo oil field, embracing 6,500 acres. This action is taken pending a careful geological investigation by the United States Geological Survey to prevent the terrific waste of natural gas now chargeable to the Caddo fields. The total waste in the Caddo field is estimated at 75,000,000 cu. ft. of gas daily, or more than one twentieth of the total amount of natural gas usefully consumed in the United States.

25 *years ago*

December 14, 1933

Forty automobile models are now using high compression as compared with 28 last year, F. R. Speed of Ethyl Gasoline Corp. says in reporting a survey of trends in modern gasoline engine design and fuel design.

Of the automobiles sold in 1932, 28 models could be purchased with high compression heads as standard or optional equipment. The average high compression ratio for these 28 models in 1932 is 5.8. The list of cars on which high compression heads are available in 1933 is increased to 40. The average compression ratio for all 1933 high compression cars is 5.97.

The Cities Service group of oil marketing companies have all signed contracts with Ethyl Gasoline Corp. for the sale of ethylized gasoline.

10 *years ago*

December 16, 1948

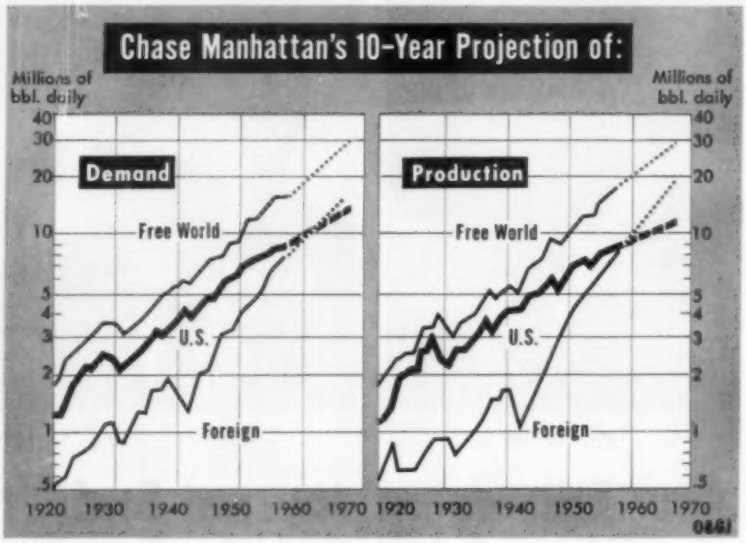
The petroleum industry is in position to meet total demands during 1949, it was declared unequivocally by the economics advisory committee in making its report to the Interstate Oil Compact Commission. This optimistic forecast, the first such in several years, was greeted with applause.

A Hungarian people's court has imposed a death sentence on the former manager of the Hungarian affiliate of Standard Oil Co. (N. J.) following a 2 weeks' trial on what the U. S. State Department earlier said were trumped-up charges of sabotaging the country's oil production.

Production of Creole Petroleum Corp., major operator in Venezuela, during October averaged 649,627 bbl. daily, a drop of 4,232 bbl. daily from the average for September.

Free-World Demand Gain Set at 6.3%

- Foreign demand to jump 7.7% yearly; U. S. demand to rise an average of 5%.
- Steady U. S. rise means 670,000 wells, 3 billion feet of hole in 10 years.



TOTAL DEMAND for petroleum in the free world will reach a whopping 29,500,000 bbl. daily in 1967.

This breaks down to 14,400,000 bbl. daily in this country, compared with 8,817,000 bbl. in 1957, and 15,100,000 bbl. in foreign countries, compared with only 7,173,000 bbl. last year.

This is the principal conclusion of Chase-Manhattan Bank in its annual study of the growth of the petroleum industry.

Meeting such a demand in the United States, the study says, will require the drilling of 670,000 wells and 3 billion feet of hole in the 10-year period.

In the final year, 1967, the U. S. industry must drill nearly 75,000 wells and make 350,000 million feet of hole.

Other predictions . . . Capital expenditures of $140 billion will be required to support the world-wide expansion.

This is almost double the $72 billion spent for property, plant, and equipment during the past 10 years.

Most of this huge outlay will be spent abroad, since rising costs in this country are sending more and more domestic producers outside the U. S. to search for oil.

Foreign spending, the bank estimates, will increase 140% over that of the past 10 years. Domestic expenditures will rise 70%.

The bank study was made by Frederick G. Coqueron, Harold D. Hammar, and John G. Winger. They also concluded that:

. . . Total energy needs in the U. S. will jump from the equivalent of 20 million to 30 million barrels of oil daily.

. . . Oil and gas will increase their share of this total market from 69% in 1957 to 74.5% in 1967. This will be at the expense of coal, which will drop from 27% to 22%.

. . . Gas will continue to take markets away from oil. In some areas they don't compete, but demand in the areas where they do may equal 13 million barrels daily by 1967. Of this, oil's share is expected to be about 5 million.

. . . Inadequate exploration may result from the oil-gas fight. Sale of gas returns less to the producer than does the sale of oil for a given amount of energy. There may not be enough money to do the necessary drilling as gas increases its share of the petroleum market.

The energy market . . . Home heating and cooling will be big factors in increasing total energy demands.

U. S. population is expected to increase by 30,000,000 to a 200,000,000 total by 1967. Along with this, Chase Manhattan is counting on an increase in per-capita use of energy as home ownership increases and as people seek to add more living comfort.

Total energy demand in 10 years is forecast at 63.5 quadrillion B.t.u.'s, compared to 42.1 quadrillion last year.

The oil-gas problem . . . While oil will make gains, gas will keep cutting in on its markets.

This will continue until some change in the field of regulation permits the price of gas to come more closely in balance with that of oil.

Oil-marketing practices also work to the advantage of gas, the study said. Strong sales efforts are made on behalf of gasoline while fuel oils, which are in direct competition with gas, are "virtually ignored." In contrast, gas utilities are "commendably aggressive" in promoting use of gas.

To insure an intensive search for new reserves, the "whole barrel must be sold vigorously, not just the half from which gasoline is derived."

Much of the gas discovered is found incidental to search for oil. If gas, which yields little revenue to the oil industry, continues to displace oil, there "may not be sufficient funds generated in the future to support an adequate exploratory effort."

Every time a consumer of oil converts to gas, or a new potential market for oil is captured by gas, revenue to the oil industry is reduced to 20%, or less, of what it would have been.

The average wellhead value per barrel of oil and gas combined, in terms of constant 1957 prices, has dropped 13% during the postwar period, the report said.

This came about because production of low-value gas has grown more than twice as fast as output of higher-value oil hydrocarbons.

Reserves . . . A sharp increase in annual additions to U. S. reserves was labeled a "must."

Since World War II, yearly additions have averaged 3 billion barrels. Over the next 10 years the bank believes an average of 3.3 billion barrels is the maximum yearly addition that may be "reasonably expected." This would indicate a crude-oil producibility of 9.5 million barrels daily by 1967.

Of the 3.3 billion to be added yearly, half a billion may be found on the Continental Shelf. At least 100 million a year, the bank predicted, may be found in new sedimentary basins, particularly in Alaska.

Wilmington Flood Grows

. . . in $60,000,000 antisubsidence program. Water input of 500,000 bbl. daily expected soon after mid-1959.

WILMINGTON operators are slowly chipping away the mountain of legal and engineering problems which must be removed before water flooding can be applied on a field-wide basis.

Just when water injections will reach the full-speed rate of about 1,000,000 bbl. daily can't be set until further progress is made toward unitization. But all operators are aware of the urgency created by land subsidence and are proceeding on a "crash" basis.

Last week an average of 185,000 bbl. of water was injected daily, the highest level so far. From progress being made in determination of equities in some of the more critical portions of the field, the injection rate may reach the 500,000-bbl. mark soon after mid-1959.

Huge undertaking . . . Repressuring California's largest field is by far the largest water-flooding project attempted to date.

It involves 117 operators and an area of some 6,500 acres. About $60,000,000 will be required for injection facilities and operating expenses (see table). An estimated 400,000,000 bbl. of secondary oil is at stake.

The big financial outlay will be only partially for increasing oil recoveries. An equally important objective will be to halt land subsidence. Remedial work so far has cost more than $90,000,000. An additional $50,000,000 damage is forecast if surface sinkage is not checked.

At the center of the 20-sq.-mile, bowl-shaped subsiding area a drop of 25 ft. already has occurred. It is continuing to sink at a rate of about 1 ft. per year. Estimates of how much more the center will drop range from about 10 ft. to as much as 18 ft.

Because the Navy's Terminal Island shipyards are involved, a federal suit filed last summer threatens to shut down the entire field if remedial steps are not taken (OGJ, Aug. 25, p. 52).

What's ahead . . . Repressuring is planned for the entire field but little effort is being made at this time in Fault Block 1.

Lying on the northwest edge of the field, this area is well removed from the center of subsidence. Faulting is thought to isolate it from any effects of flooding in Block 2.

Progress made in the other fault blocks is directly related to the number of operators involved. Most water is being injected in Blocks 4 and 5. These areas, and Block 6, are largely owned by the city of Long Beach, with the remainder being controlled by less than a half-dozen oil companies. Full-scale operations will first be achieved there.

Securing adequate water will be no problem as ocean brine from shallow wells is readily available in large quantities. Several wells only 120 to 200 ft. deep are yielding 20,000 to 30,000 bbl. daily. One 400-ft. well has been tested at a 75,000-bbl. daily rate, capacity of the pumping equipment.

From most viewpoints this filtered ocean water offers no problems. In addition to being compatible with waters present in the oil formations, it is oxygen free and has such a low turbidity that no filtering is required. No serious plugging of the formation has occurred even though no chemicals are used to prevent the precipitation of barium and stontium sulphate.

Corrosion . . . Several years' experience with pilot floods has shown that corrosion is a serious problem.

Even when oxygen is excluded from injection wells, corrosion occurs at a rate of about 13 mils per year. Protection in water source wells and lines in the low-pressure system is secured principally through use of corrosion-resistant materials.

Long Beach Oil Development Co., contract operator for the city in much of Fault Blocks 4 and 5, has successfully reduced corrosion to a level that can be lived with (less than 1.5 mils per year) by use of inhibitors. Using organic compounds which provide bactericidal control as well as corrosion protection, the cost is approximately 1.5 mils per barrel of injected water.

In an effort to reduce the cost still further, and to achieve better protection, LBOD and other operators are carrying on extensive inhibitor evaluation programs.

Wells shut in . . . The fight against subsidence was approached from a new front last week when the Long Beach Harbor Department ordered its two contract operators to shut in or restrict oil output from 30 wells having high gas-oil ratios.

By the end of the week it was expected that oil production from properties operated by LBOD and Richfield Oil Corp. would be cut by 1,000 bbl. daily (down to 33,000 bbl.) and gas production by 5,000 M.c.f. daily. Thus the 3% cut in oil output was to result in a 12% drop in gas production. Some of the wells involved had ratios in the range of 10,000 cu. ft. per barrel.

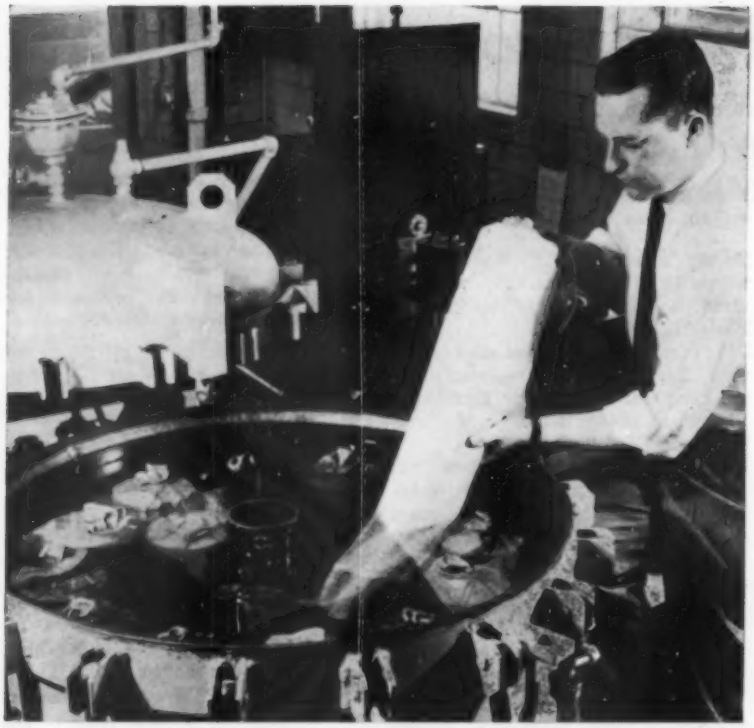
Additional high-ratio wells are to be closed in or restricted. Frank Hardesty, chief harbor department petroleum engineer, said a total of about 100 wells were involved. Where competitive conditions permit, and where the action does not interfere with floods already under way, output from these wells will be curtailed.

The move is intended to help conserve reservoir energy and accelerate restoration of reservoir pressures.

Plans for the big Wilmington flood gained impetus last summer when the Department of Justice, at the Navy's request, filed suit asking either for compulsory repressuring or shutting in the field. The Government is also seeking multimillion-dollar damages against operators for subsidence to government installations, particularly the huge Long Beach Navy shipyard. A hearing for dismissal of the case is scheduled January 15.

Cost and Injection Plan for Water Flooding Wilmington Field

Fault Block	Injection Wells				5-Year Injection Plan		Cost for 5-Year Plan		Current injection rate, B/D
	New	Converted	Existing	Total	Injection rate, B/D	Total water, bbl.	Facilities	Operating	
2	24	24	3	51	229,000	418,000,000	$ 5,294,000	$ 8,352,000	9,000
3	15	25	13	53	161,000	293,000,000	4,291,000	5,858,000	14,000
4	35	25	3	63	305,000	556,900,000	7,300,000	11,100,000	58,000
5	24	27	8	59	193,000	352,500,000	5,200,000	7,000,000	90,000
6	18	5	10	33	53,100	97,067,000	3,424,000	1,941,000	14,000
Total	116	106	37	259	941,100	1,717,467,000	$24,509,000	$34,251,000	185,000



HEART of jet-fuel filtering system is checked by a Shell engineer.

Jet-Fuel Problems Tackled

. . . at Shell's new lab. Tests which simulate actual field conditions are expected to result in protection measures.

SHELL OIL CO. has taken steps to solve some of the fuel problems of the jet age.

Shell has set up the first laboratory devoted entirely to testing and evaluating filters and other equipment used in the handling of turbine fuels.

Jet fuel is more susceptible to contamination than aviation gasoline.

Aviation gasoline has never been seriously plagued with contamination by dirt, rust, or water. However, jet fuel, because of its higher gravity and lower viscosity, has a greater tendency to retain contaminants.

Their presence in jet fuel can be dangerous. Dirt or rust can interfere with fuel burning and, in extreme instances, can cause engine failure. Water can block filters by freezing and can also cause engine failure in flight. This makes it imperative that only clean, water-free fuel be used in jets.

Shell's new Sewaren, N. J., lab can test fuel in a full-sized airport fuel-dispensing installation. It has facilities for introducing dirt and water at controlled rates, allowing it to simulate the most severe field conditions. Its analytical equipment enables it to:

. . . **Evaluate filtration** equipment under field conditions at flow rate up to 600 g.p.m.

. . . **Add dust and water** contaminants at controlled rates.

. . . **Detect and measure** quantitatively dirt particles as small as 0.5 micron.

. . . **Measure the water** content of fuels automatically to an accuracy of 1 p.p.m.

The laboratory expects to develop protection measures which will continuously sample fuel on its way to plane tanks and will automatically shut down the refueler if dangerous contamination, either solid or water, is detected.

Hancock, Signal Merger Set

SIGNAL OIL & Gas Co. will become the largest independent on the Pacific Coast when the merger with Hancock Oil Co. becomes effective December 31.

The merger, approved earlier this month by more than 90% of the companies' stockholders, will give the integrated company assets of about $500,000,000 and domestic production of 65,000 bbl. daily (OGJ, Sept. 22, p. 52).

Samuel B. Mosher, chairman of Signal's board, and Russell H. Green, Signal president, will retain those posts. Directors of both firms will serve on the board of the newly combined company. Signal will continue to operate Hancock's chain of service stations under the Hancock banner, and Signal's own chain of Regal stations will continue under that label.

The share-for-share merger gives Signal a 50% interest in a highly successful 28,000-acre Lake Maracaibo concession.

Plans are still being studied for the partially fire-destroyed Hancock refinery at Long Beach, Calif. (OGJ, June 2, p. 80).

Husky to Expand

refining, products program. Tar-sand project continues.

CONSTRUCTION of new refining capacity and addition of new products is planned by Husky Oil Co., Cody, Wyo., in a new multimillion-dollar expansion program.

Pres. Glenn E. Nielson said the Cody refinery's capacity will be increased to 10,000 or 15,000 bbl. daily from the present 7,000 bbl. A crude-gathering line to the refinery and a products line from Cody to the Yellowstone products line west from Billings, Mont., will be included.

Nielson estimated costs at $8 or $14 million, depending on the size of the expansion.

Other Husky projects include low-temperature coal carbonization, phosphate fertilizer manufacture, and recovery of oil from tar sands.

Tar-sand project . . . Since 1955 Husky has been working with Swedish Shale Oil Co. near Santa Cruz, Calif., to test an in-place method of using heat to extract oil from tar sands.

The process has been used successfully on oil shales in Sweden for over 10 years. Union Oil Co. of California joined the two other firms in the project a year ago.

Nielson said 32°-gravity green oil is now being produced from tar sands in a second 100-hole pilot area. The amount of oil produced so far indicates recovery of 18,000 bbl. per acre from a lean 30-ft. formation, he said.

Husky owns one-third interest in the patents and operational knowledge covered by the process and leases on more than 10,000 acres of bituminous sand deposits in California and Utah.

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New Miscible Methods

. . . seen as future spur to secondary, tertiary recovery. Atlantic's Kieschnick predicts cheap flue gas and new intermediate will be used in miscible drive.

NEW and revolutionary ways of applying the industry's newest oil-recovery technique—miscible displacement—were predicted last week as on the horizon.

W. F. Kieschnick, research supervisor for Atlantic Refining Co., Dallas, listed these three types of projects as good bets for actual operation in the future:

. . . **Tertiary recovery** using a miscible drive to take a third crop of oil from a reservoir previously swept by a water flood.

. . . **Use of flue gas** or some other cheap gas as the pushing force following a miscible front.

. . . **A miscible drive** using an intermediate material miscible with both water and oil so that the miscible process could operate in reservoirs with pressures lower than 1,000 psi.

A third crop . . . It has already been learned from laboratory research, Kieschnick said, that a miscible operation will bank up the residual oil left after a water flood, move this oil bank, and force it to producing wells. The same is true in a reservoir which has been produced to the economic limit via a natural water drive.

Such a project would have the drawback of having to handle a lot of water before the oil bank could be produced. But, Kieschnick said, it is well worth considering because it is the alternative to abandoning the reservoir.

"I believe that we shall see this application in the not-too-distant future," he said.

The flue-gas idea . . . Natural gas is becoming more valuable. Therefore, it is less attractive for use in large volume in oil-recovery projects.

Much of the gas injected in the gas-driven miscible projects merely fills reservoir pore space, not taking part in the actual miscible displacement.

There is no physical reason why an operator could not inject enough hydrocarbon gas (natural gas) to insure miscible displacement and follow this with a cheaper gas to fill the pore space, Kieschnick said.

"Such a gas that we might be using in a few years is flue gas—a mixture of nitrogen from the air and carbon dioxide. Flue gas can be made relatively cheap. It is an assured supply. Large volumes can be made by burning small volumes of hydrocarbons. And flue gas has a favorable compressibility so that relatively large reservoir volumes can be furnished from a given amount of low-pressure gas."

Flue gas, he said, also may be considered for direct miscible displacement. It could be used for this purpose merely by operating at higher pressures than with natural gas.

In some cases, it can be used to displace oil miscibly in the high-pressure-gas version of miscible displacement. And it can be used to miscibly push a slug of LPG intermediates through the reservoir, he said.

Where a hydrocarbon gas miscibly displaces oil at 3,500 psi., Kieschnick said, flue gas will do this at 3,900 psi. and a 50-50 mixture of the two will do it at 3,700 psi.

"I believe that in one or the other of these several applications, flue gas will find its way into miscible displacement operations."

New intermediate needed . . . One big limitation of the miscible processes is that so far they must be operated at pressures of 1,000 psi. or greater. This is because natural gas is used at one of the miscible fronts, and such pressures are required before gas and hydrocarbon liquids become miscible.

"We need an intermediate material to place as a slug between water and oil so that we can operate at lower pressures," Kieschnick said. Alcohol, if it were cheap enough, would be a suitable agent because alcohol would miscibly displace the oil, and water would miscibly displace the alcohol, he said.

"I believe there is a reasonably good chance that somebody will discover a material, or a material and a method, to achieve something equivalent to this."

Present problems . . . Still one of the biggest questions in planning a miscible drive is how much LPG is needed, Kieschnick said.

No single project is going to give the industry a general answer to this question. This is so because no two reservoirs are exactly alike. Different results will come from different reservoirs. Also, techniques have varied from project to project so far. But with more experience, the industry should develop better information on volume requirements.

Another problem arises in choosing between a miscible drive and a water flood, he said.

"Make no mistake. Water flooding is an excellent recovery process. We believe we know how to recover more oil with miscible displacement than with water under many circumstances. But it is not clear-cut many times whether it will be economical to do so.

Invariably, a miscible drive is more costly initially. But it will compare favorably with a flood as to economics, Kieschnick said, when:

1. The miscible drive can be operated at high rates of oil production, or

2. When production rates of the miscible drive can be sustained much longer than with a water flood.

No cure-all . . . No recovery process available or yet to come will prove a panacea, he said.

"We shall gradually develop an array of processes to cover the variety of situations that exist. Water flooding will still be fashionable in some areas 10 years or more from now notwithstanding new developments. Likewise, miscible displacement will be an important process—but not the only one, for a long time."

Kieschnick made his preditcions in a paper at the University of Texas as part of the series presented by Atlantic on "Frontiers in Petroleum Engineering."

PROCESSING

Wyandotte Chemicals is rebuilding portions of its recently completed ethylene-oxide plant at Geismar, La. The plant was damaged by a fire and explosion November 25. The plant is expected to be back in operation within 3 months. The plant has an annual capacity of 60,000,000 lb. of ethylene oxide. The ethylene oxide is converted to ethylene glycol and diethylene glycol. Feed stock is provided by Esso's nearby Baton Rouge refinery.

A new distillation unit is nearing completion at the 2,000-bbl. Franklin, Pa., refinery of L. Sonneborn Sons, Inc. The unit will increase capacity for specialty solvents, manufactured as byproducts of lube-oil operations.

Contract has been awarded to Canadian Bechtel for construction of a 650-bbl. alkylation plant at Imperial's Winnipeg, Man., refinery. The new

Chemicals Facing Rough Future

. . . but there's still room to grow and prosper for the firm which makes extra sales and research efforts.

HEAVY COMPETITION lies ahead for the fast-growing chemical industry. And there's still room for the smart operator to prosper.

O. V. Tracy, vice president of Esso Standard Oil Co., told members of the Chemical Specialties Manufacturers Association in New York how to stay alive in this rough-and-tumble field.

Tracy declared the chemical companies which will be alive and prospering a few years from now will be:

. . . **Making that extra sales** effort.

. . . **Conducting application research** on their products.

. . . **Giving good technical advice** to customers, because service will be an important consideration.

. . . **Doing active research** on new products to supplement or revitalize their lines.

. . . **Straining to keep costs** of manufacturing down.

The outlook . . . Besides competing with each other, chemical companies will face increasing competition from other domestic industries and from imported products.

Excess plant capacity also is becoming a problem in some lines, Tracy said. He explained attractiveness of chemicals has drawn new entries into the industry and caused well-established firms to expand. Result is excess plant capacity in such lines as benzene, methanol, butadiene, and ammonia.

And this problem is aggravated by developments outside the United States, Tracy said. After the war, Europe spent 5 or 6 years cleaning up and then the same amount of time building up. Now modern European plants are getting into full production. Countries are becoming more self-sufficient, and demand for American chemical products in those areas is decreasing.

On the other hand, excess production of chemicals in Germany and in Iron Curtain countries seems to find its way to our domestic markets without difficulty. Often the prices are dismaying too.

Another source of competition comes from new processes and new sources of raw materials.

Tracy cited that phenol, for instance, can be made commercially from four different processes, polyethylene from four, acetone from three, and ethylene glycol from four.

Petroleum is a classic example of chemical competition from new source of raw material. Oil now competes with natural fats in making glycerin, fatty acids, and alcohols. It supplements coal as source of benzene, toluene, and other aromatics. Petroleum components also produce the lower alcohols formerly coming from molasses, grain, and other farm materials. Petroleum is the principal source for constituents in synthetic rubber.

Tracy said all this competition means only one thing to the chemical manufacturer: There's no room for complacency.

Utah Orders Proration

THE UTAH Oil and Gas Conservation Commission has formally ordered proration in the Paradox basin in an attempt to limit waste of oil and gas.

Through the move, the commission laid claim to jurisdiction over oil and gas operations on Navajo Indian lands within the state. Attorney for the Navajo Tribal Council protested the action.

The proration order based production volumes on oil-gas ratios and pegged gas output for time being at 42,000 M.c.f. daily. This will be raised when El Paso Natural increases its ability to move more gas to market.

Commission officials said eventually per well oil and gas allowables also will be based on reservoir pressure conditions as related to secondary-recovery operations.

BRIEFS . . .

plant will help make western Canada self-sufficient in gasoline supplies for piston-operated aircraft. The $2,600,000 project will begin next spring, with completion scheduled in September.

Wax capacity has been hiked fivefold at the 52,000-bbl. Cleveland refinery of Ohio Standard. The company has installed a new $365,000 Greer continuous-molding machine which now turns out 60,000 lb. of wax in an 8-hour shift. This compares with only 12,000 lb. through the old batch-molding procedure.

A 14,000-bbl. asphalt plant has gone on stream near Linden, N. J. Cities Service's new plant is designed to handle four different charge streams on a segregated basis. Feed stocks will include crudes from Venezuela's Boscan and Lagunillas fields, Mexico's Panuce field, plus refinery tar bottoms. Output will include more than 56 different asphalt products to meet specific customer requirements. Prime contractor was C. F. Braun.

A new natural-gasoline plant has been put into operation by N. C. Ginther and Excelsior Oil Corp. a mile south of Goodrich, Colo. The $750,000 plant is producing 18,000 gal. of liquids from 5,000 M.c.f. of natural gas daily. Dry gas is delivered to Kansas-Nebraska Natural Gas Co. Chandler Construction Co. completed the plant in 3 months.

New operating units have gone on stream at Shell Oil Co.'s Norco, La., refinery. They include a Platformer, a cat-cracked gasoline splitter, six new floating-roof tanks, and minor facilities. The units are part of a multimillion-dollar expansion.

A new Platformer has been put into operation at American Petrofina's El Dorado, Kan., refinery. Work was done by Petrofina's local engineering and labor force. The unit was started in 1956 but delayed to permit fulfillment of extensive jet-fuel contracts.

Also for Refiners . . .

IN THE NEWS: Japanese have launched world's biggest tanker, a 104,500-ton vessel which will make the Kuwait-to-Japan run for Mitsubishi Oil (p. 65) . . . New crude-oil price cuts posted in Oklahoma, Kansas, and Denver basin (p. 67) . . . Chase Manhattan Bank study predicts free-world demand of 29,500,000 bbl. daily by 1967 with a domestic demand of 14,400,000 bbl. daily (p. 74) . . . Shell has set up first lab devoted entirely to jet-fuel problems (p. 76) . . . Husky is planning a multimillion-dollar refinery expansion program (p. 76).

PLUS THIS TECHNICAL REPORT: Ammonia supply and demand in balance by 1961 (p. 109).

Congrats and $25 to R. W. WARING, 511 Oil & Gas Bldg., Oklahoma City.

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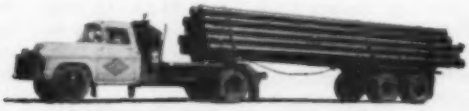

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Shell's Line Pushed Through Swamps

A BARGE of Glaser Construction Co. is literally pushing 8-in. pipe through the Louisiana marshes.

The barge welds a length of pipe and then pushes it forward through a ditch (photo). Four miles ahead of the barge (beyond the photo, top left), two marsh buggies are guiding the same string of pipe.

Usually in laying pipe in the swamp, a dredge clears a channel wide enough for the pipe-laying barge to move along the route, laying the pipe behind it. By pushing the pipe through a ditch, the company is saving in canal-dredging costs.

Pushing pipe is common in the swamps, but usually for only short distances.

The work is being done on Shell Pipe Line Corp.'s Delta pipeline from the tip of the Mississippi River Delta to Shell's Norco, La., refinery (OGJ, Nov. 3, p. 61). Glaser and Houston Contracting Co. are laying the 115-mile line, and J. Ray McDermott & Co. is installing the major water crossings.

Deep Wells Testing

up the hole. Phillips plugs back at 1-EE University.

PHILLIPS Petroleum Co. has plugged back to 22,575 ft. at the world's deepest hole in Pecos County, Texas, after testing salt water in the Ellenburger.

The 1-EE University had tested Ellenburger perforations at 24,967 to 25,322 ft. Last week, the company was getting ready to test Montoya perforations at 22,310-22,500 ft. The wildcat was bottomed earlier this fall at 25,340 ft. It was the first ever to pass the 25,000-ft. mark (OGJ, Sept. 29, p. 33).

The world's third deepest hole, the Phillips 1-A Montgomery, 13 miles southwest of the 1-EE, was preparing to test Devonian perforations at 19,650-19,713 ft. after Montoya tests yielded salt water at 19,830-19,950 ft. Neither the deeper Ellenburger nor the Simpson yielded pay on earlier tests.

However, last month Phillips successfully tested another Pecos deep well in the Wolfcamp at about 14,600 ft. The 1-A Harral, 10 miles southeast of the 1-EE, tested 25,000 M.c.f. of gas daily through ¾-in. choke after acidizing.

At the world's second deepest hole, the 5 Rumberger in Elk City field of western Oklahoma, Shell Oil Co., was cleaning out for the third or fourth time in an attempt to open-hole test the Springer sand and dolomite. Plug-back depth is 22,544 ft., with total depth of 24,002 ft.

INDUSTRY BRIEFS . . .

Two important extensions have been made at Swan Hills, Alberta's major new oil field. On the south end, Pan American and British American's 14-33 Swan Hills flowed 56 bbl. of oil per hour through ½-in. choke on first drill-stem test of the Beaverhill Lake-Middle Devonian. The field was extended southeast at Pan Am's A-1 Morse River 4-13 which flowed 242 bbl. of oil daily through 13/64-in. choke on 12-hour test.

Shareholders owning more than 80% of Humber Oils, Ltd., have accepted the Pacific Petroleums, Ltd., offer to exchange nine shares of Humber for one share of Pacific Petroleums. The offer will continue for about another month in Canada, and then U.S. shareholders will be invited to exchange.

Capital expenditure of $100,000,000 for the 1959 fiscal year has been approved by Tidewater's board of directors. This is the same amount as the capital outlay for 1958. The new figure boosts total capital expenditures to $831,000,000 since 1953 when the company launched its long-range expansion and modernization program.

The name of Unapache Oil Corp., Texas subsidiary of Apache Oil Corp., Tulsa, has been changed to Apache Production Co. The firm is carrying out an extensive drilling program in the Texas Panhandle and recently had two significant oil and gas discoveries in Lipscomb and Hemphill counties.

The assets of Arrow Gas Corp. have been purchased by National Propane Corp., New Hyde Park, N. Y. During its last full fiscal year, Arrow had revenues of more than $5,000,000 and sold about 60,000,000 gal. of LPG. National Propane's present revenues are $14,000,000, with gallonage of about 55,000,000. Majority stockholder of Arrow was Malco Refineries, Inc., Roswell, N. M.

The Air Force has been authorized to set up 2,850,000 bbl. of storage for protection against nuclear attack. Floating-roof tanks, buried or semi-buried tanks, and washed or mined caverns will be obtained.

The capacity will be located in four areas. The Crockett-Martinez area of California will get one million bbl.; 835,000 bbl. will be located near Grand Forks, N. D.; 400,000 bbl. in the Gladstone-Escanaba area of Michigan; and 615,000 near Rome, N. Y.

Florida Offshore Sale Planned

. . . next spring. Interior is offering 840,000 acres of outer shelf with lease nominations due in February.

THE INTERIOR Department, which last sold oil and gas leases in the far north, is going to the far south for its next venture.

The Bureau of Land Management has paved the way for auctioning leases on the outer Continental Shelf off the southernmost tip of Florida next spring.

The bureau invited oil and gas operators to nominate leasing blocks in the Marquesas area in the Straits of Florida. Nominations will be accepted up to February 1.

An official leasing map of the area has been prepared. Copies of the map may be secured for $1 each from the bureau in Washington or its Outer Continental Shelf Office in New Orleans.

The area to be opened by the bureau lies southwest of the Marquesas Keys. The four small islands are about 25 miles almost due west of Key West.

Nominations are to be selected among some 80 blocks which have been mapped out by the bureau. Each block is 5,760 acres, and the total offered for nomination is about 840,000 acres. The mapped area is an oblong, running east and west starting 3 miles from the islands. Water depth ranges from 20 to about 600 ft.

Next year's lease sale will be the first held since July 1955. The department's shelf activities have been dormant because of the dispute between the federal Government and the gulf states over their boundaries.

Title to the submerged resources of the Marquesas area is in dispute, Florida claiming a 3-league limit off the Gulf Coast.

The issue was to have been argued before the Supreme Court last month but was put off. It is expected it will be disposed of, however, before the lease sale is held next year.

Wide interest . . . There has been considerable industry interest in the shelf off the south Florida coast for several years.

Two or more companies are reported to have suggested as far back as a couple of years ago that the department open up the area. All previous leasing, however, has been off the coasts of Texas and Louisiana, several hundred miles to the northwest.

But wildcatting on state leases in the keys area off the southwest coast of Florida is not a new thing. Gulf Oil Corp., for example, has drilled at least three dry holes in that area. One of them, the 1 Scranton-State about 30 miles northeast of Key West on Big Pine Key, went to 15,455 ft. Another was drilled on Sugar Loaf Key 18 miles northeast of Key West, and still another about 8 miles off East Cape in Florida Bay.

The bureau announced it will accept nominations for whole blocks or subdivisions of blocks. Nominations are to be sent to the director of the bureau in Washington, with a copy to the regional oil and gas supervisor of the U. S. Geological Survey in New Orleans.

Texas Pollution Hearing Set

THE TEXAS Railroad Commission will hold a hearing December 15 at which operators in several Wharton County fields will be called on the carpet for polluting fresh-water sources in the area.

The commission said an investigation of salt-water disposal practices in six Wharton reservoirs indicated that pollution is taking place and threatening to cause serious, possibly irreparable, damage to fresh-water supplies.

The affected pools are: South Hutchins, Southwest Hutchins (5,800-ft. sand), Hutchins-Kubela (Gilcrease sand), Hutchins - Kubela (Hutchins sand), Hutchins-Kubela (Kubela sand), and Pickett Ridge.

Shell Works Fast

to develop pay at Canada's best 1958 oil discovery.

SHELL Oil Co. of Canada, Ltd., will kick off a big drilling program at its new Woodbend-Devonian reef discovery in Alberta by drilling four 12,000-ft. development wells immediately.

The first four locations in the big campaign are within 2¾ miles of the 12-9 Simonette River which is flowing 12 bbl. of oil per hour from about 11,400 ft. The well is considered the best oil discovery so far this year in western Canada (OGJ, Nov. 10, p. 93). The area is one of the busiest in Alberta outside the Swan Hills area.

Shell will drill all four wells at the same time. Drilling is scheduled to start this week.

The discovery is just 29 miles northwest of the recent Berland River gas

PIPELINE BRIEFS . . .

Throughput of 378,731 bbl. daily was reported by Trans-Arabian Pipe Line for November compared with 339,385 bbl. daily for the same month a year ago. Crude deliveries into the Sidon, Lebanon, terminal during the first 11 months of 1958 averaged 369,000 bbl. daily, up some 26,000 bbl. daily from the corresponding period a year ago.

A $55-million expansion by Southern Natural is scheduled for hearing January 20 before the Federal Power Commission. Southern plans to raise capacity by 325,000 M.c.f. from the present 988,762 M.c.f. daily by building 461 miles of 16/24-in. main-line loops, 115 miles of branch lines, 111 miles of field and supply laterals, and 8,624 hp. in compressor capacity. The facilities are needed to meet increased requirements for the 1960-61 heating season.

Increased deliveries of 130,000 M.c.f. daily are proposed by Northern Natural in a new construction program to be placed before FPC. Northern proposes to build facilities to serve 326 additional communities in Iowa, Minnesota, South Dakota, Nebraska, Wisconsin, and Illinois.

FPC previously denied a plan to serve 208 of the communities using Northern's Redfield, Iowa, underground storage for 50,000 M.c.f. daily on grounds the facility had not proved its ability to perform this service. The company plans to continue de-

discovery, which is not only Canada's biggest single gas well, but the country's deepest producer at 12,014-12,235 ft. (OGJ, Sept. 15, p. 108). Production is from the D3 reef, thickest reef ever found.

Shell's Simonette discovery is about 28 miles northeast of Texaco Exploration Co.'s 8-28 Simonette River, which toppled Canada's drilling depth record last month when it passed the 15,283-ft. mark (OGJ, Nov. 17, p. 143).

Shell's acreage . . . The four Shell locations are on acreage originally farmed out to Shell by Petrol Oil & Gas Co., Ltd., and Central Explorers, Ltd.

The locations are on LSD 12, 3-63-25w5; LSD 10, 5-63-25w5; LSD 4, 17-63-25w5; and LSD 10, 1-63-26w5. The discovery is on LSD 12, 9-63-25w5, 35 miles southwest of South Sturgeon Lake field and 35 miles west of Kaybob field.

Land-Grant Case Appealed

UNION PACIFIC Railroad has asked the Colorado Supreme Court to set aside a recent decision which ruled against the railroad's claim to mineral rights on land-grant acreage. UP said the decision would change "long-established rules of real property law . . . recognized without exception not only in Colorado but throughout the U.S."

The case involves a tract in Logan County owned by Sara Mildred Radke and Edward F. Karr (OGJ, Nov. 3, p. 61). The decision reversed a lower-court ruling that railroads legally retained mineral rights when land granted by Congress was sold to private interests.

Fast-Growing Field Extended

• Little Creek is booming with 43 producers finaled in less than a year.

MISSISSIPPI'S prolific Little Creek field has taken another long jump to further entrench itself as one of the state's largest and richest discoveries in recent years.

A newly completed well nearly 2 miles south of the field is stretching the known producing area more than 3½ miles from north to south. The width is 1½ miles at its widest point.

The new extension follows a 1½-mile northeasterly expansion of the field 2 months ago that may provide a link with Little Creek's older sister, Sweetwater field.

Both fields are productive from the same lower Tuscaloosa formation at about 10,700-800 ft. Drilling is already under way in the intervening area, although a dry hole limits production at one point.

The south extension, the 1 Bryant Estate drilled by George Harrison and D. A. Biglane, flowed 385 bbl. of 39°-gravity oil daily through 11/64-in. choke from 10,746-78 ft. Gravity, flowing pressure of 1,120 psi., and other producing factors are comparable to those in Little Creek proper.

Rigs busy . . . Operators have drilled 43 producers since Shell Oil Co. opened the field last January. There are 11 active drilling operations.

Well completions have been marked by unusually prolific flow rates, ranging up to 870 bbl. daily through small chokes. Average initial flow rate for the 43 wells has been 410 bbl. per day. Choke sizes range from ⅛-in. to ¼-in.

Shell, with 26 producers, is the largest operator in the field. Others include Sun with two wells, Skelly with two, and Sinclair with one. Various independents, including Biglane, Harrison, Dorris Ballew, Vasser & Howard, and others, own 12 wells.

Shell recently announced plans to build a refrigeration-type gasoline plant at Little Creek. The plant, 10 miles northeast of McComb in Pike County, will have initial capacity of 5,000 M.c.f. daily (OGJ, Dec. 8, p. 56).

velopment of Redfield but will gain the required new capacity through new pipeline construction.

An extension of Interstate Oil Pipe Line's system to Raleigh-Martinville-Magee fields in Mississippi is scheduled for completion this week. Ford, Bacon & Davis is contractor on the 30-mile, 6 and 8-in. project. The line, which will join the Interstate system at Gwinville Junction, Jefferson Davis County, will provide pipeline service to the newly discovered fields in Simpson and Smith counties.

A new connection to the Basin and Trenton pools in Kingman County, Kansas, is being made by Skelly Oil Co. Mitchell Construction Co., Inc., Wichita, Kans., is laying 18 miles of 3 through 6-in. The line is to be completed this week end.

A 26-mile gas line is being laid by Houston Pipe Line between Mathis and Odem, Tex. H. B. Zachry Co., San Antonio, has the contract. The job will be completed the first of the year.

A 72-mile, 6 and 8-in. crude line is under construction from Greensburg to Louisville, Ky., to supplant truck transportation from Green County field (OGJ, Dec. 1, p. 86). The $2-million project by Ashland Oil & Refining is composed of 42 miles of 6-in. and 30 miles of 8-in. with 500-hp. stations at Greensburg and New Haven. The line will be able to handle the 19,000 bbl. daily.

Also for Pipeliners . . .

IN THE NEWS: A quick jump from gloom to boom is the prospect for pipeline construction following Supreme Court reversal of the Memphis case (p. 63) . . . Battle for California gas markets looms as Transwestern gets hearing on its plans for a Texas-to-California pipeline (p. 65) . . . Settlement appears nearer in Colorado Interstate rate dispute (p. 67) . . . Alberta & Southern and Westcoast Transmission revise their requests to export gas to U. S. (p. 67).

A complete list of pipeline projects is carried in the last issue of each month. Current projects are reported in Pipeline Briefs.

PLUS THESE TECHNICAL REPORTS: Northern Natural's outlook for gas-transmission systems (p. 99) . . . Interface detectors have made progress but are not perfect (p. 119).

Venezuelan Election Could Change Oil

• President-elect has policy which includes national oil company, more government profit, no new concessions. He also favors production limit.

STREET RIOTS last week swirled about the political head of a chunky, bespectacled Venezuelan who for the second time in his life is to be president of his country and a power in Western Hemisphere oil.

Political violence is not new to Romulo Betancourt, leader of Venezuela's big, leftist Accion Democratica party. Last week he was talking confidently about the future and discounting the importance of the rioting. In Caracas streets, squads of soldiers and police armed with rifles and machineguns used tear gas against youthful mobs screaming dissatisfaction over the Betancourt defeat of Adm. Wolfgang Larrazabal.

Betancourt has experienced all this before. In 1948, after serving only 3 years of his 5-year term, he was ousted from office by the military in a coup which eventually put the recently deposed dictator, Marcos Perez Jimenez, in power. Betancourt fled the country and lived in New York until the January revolution.

This time, the Betancourt confidence may be founded on something stronger than wishful thinking. All Venezuela's political parties, including the communists, deplored the rioting. Even the military, which in the past has showed little love for the president-elect, is pledging support for him as the newly elected president.

Election night, even as the votes were being counted, all three of the country's presidential candidates vowed the new administration will be a coalition government with all major parties having at least some voice.

All this points to a smoother way for Betancourt if he actually does take office January 25 as he confidently expects. He may have some uncomfortable moments spending the next 5 years in the capital city of Caracas, where voters preferred Larrazabal by a 5-to-1 margin over him.

Oil's stake . . . The presidential race was one based largely on party and personality.

The one real issue of the entire election on which everyone was united was oil. All the parties and all the candidates want a bigger bite of the country's oil revenues for the country and the government (OGJ, Oct. 27, p. 62).

Romulo Betancourt
. . . returns to presidency.

Betancourt has always fancied himself an authority on Venezuelan oil. The subject cropped up continually in his campaign speeches, even in the weeks before he was an avowed candidate for president. During his exile years in New York, he wrote a book, "Venezuela, Politics and Oil," which he quoted frequently in his speeches.

The president-elect believes firmly that Venezuela's oil production should not go any higher than 3 million barrels daily, a potential which it would easily top today. He preaches unless production is stabilized at this figure the country's reserves will be wasted.

His estimate of 10 billion barrels for the proved reserves of the country is only about two-thirds the figure set by the efficient and engineering-minded Venezuelan Ministry of Mines and Hydrocarbons. The latter reserve estimate is even lower than those set by other observers.

No one in Venezuela's privately owned and operated oil industry is hazarding any guesses on its future with a Betancourt-headed government. But, the new president's oil policy was pretty well outlined in his campaign.

Here are his major oil points:

. . . **More profit** from oil for the government. Like most of the other Venezuelan politicans, Betancourt is fond of pointing out the recent new concessions in the Middle East on a different basis than the traditional 50-50 split of profits.

. . . **A national oil company** for Venezuela. Betancourt concedes that this concern probably will have private capital, but he insists that Venezuela keep control.

. . . **A national tanker** company to transport Venezuelan oil.

. . . **More refining** of his country's oil production within the borders of Venezuela. Today slightly less than 33% of Venezuela's daily output of oil is processed in refineries located in Venezuela. This is not enough, according to the president-elect.

. . . **No new oil concessions.** Betancourt contends that all the rest of Venezuela's prospective oil lands must be kept in reserve for the day when the country runs out of oil. Betancourt likes to cite figures indicating that only a small percentage of the lands now held under concession have been explored enough to make them either productive or nonproductive.

Panama Coast Wildcat Dry

CHAMPLIN OIL & Refining Co. and partners last week abandoned their second wildcat off Panama's northwest coast.

The 1 Agua Cay was bottomed out at 6,678 ft. in the Laguna de Chirique. The second test was roughly 40 miles west of the combine's first, the 1 Anita Bay, abandoned at a total depth of 9,685 ft. several weeks ago. The 1 Anita Bay was also located in the big lagoon in about 45 ft. of water.

Champlin is operator for itself, Southland Royalty Co., and Kerr-McGee in an 870,000-acre concession in northwestern Panama. The bulk of the concession is in Laguna de Chirique.

The two wells, though dry, have borne out geophysical data which indicated a thick section of sedimentary rocks under the concession.

Champlin and partners plan a comprehensive study of geological data obtained so far before doing any further drilling.

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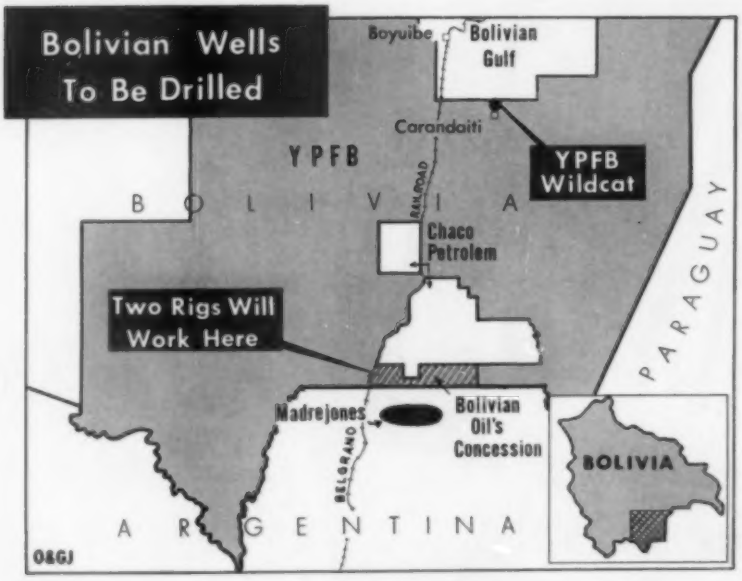


Big Chief on Way to Bolivia

. . . to launch two drilling programs. One will be a YPFB wildcat. The other will test Bolivian Oil Co. acreage.

SPUDDING of a wildcat about February 15 will launch the first of two Bolivian drilling deals for Big Chief Drilling Co. of Oklahoma City.

The test, projected to 18,000 ft., is to be drilled under a 3-year contract with Yacimientos Petroliferous Fiscales Bolivianos (YPFB), Bolivian Government oil agency.

Big Chief also has a contract to drill in the Bolivian portion of the Madrejones block along the southern border. Target date for start of operations there is March 15.

The firm is shipping three rigs, capable of drilling to 18,000 ft., to Bolivia. The first, already on its way, will be used in the YPFB program. The other two rigs will be used in the Madrejones block.

Big Chief also will have 34 Americans in Bolivia to direct and carry out the operations. A Big Chief subsidiary, Big Chief International Corp., has been formed to own the drilling equipment and other properties. Big Chief Bolivian Drilling Co. will be the operating company in Bolivia. Central operating headquarters will be in Cochabamba, with field headquarters at Yacuiba.

The YPFB deal . . . The first wildcat under the exploration contract will be located north of the town of Carandaiti in the Chaco jungle.

If the test goes to the projected 18,000 ft., it will be the deepest well in Latin America. Shell drilled a test to 17,537 ft. near the town of Lagunillas on the eastern side of Lake Maracaibo in Venezuela.

The rig for the deep test was shipped from Houston and is scheduled to arrive in Buenos Aires the end of this week. It then will be moved over the narrow-gage Belgrano railroad, 1,500 miles to Boyuibe, then by truck 60 miles to the location.

Jack H. Abernathy, Big Chief president, said the well should be spudded about February 15.

Madrejones operation . . . Big Chief's second contract is to test the Madrejones block awarded Bolivian Oil Co. last April.

Bolivian Oil has the 108,000-acre Madrejones concession on the southern border of Bolivia. Fish International Corp., which made a strong bid for the concession itself, holds a 5% interest in Bolivian Oil Co. (OGJ, April 28, p. 74). Bolivian interests have the other 95%.

The concession lies between the Argentine border and acreage held by Chaco Petroleum Co., subsidiary of Tennessee Gas Transmission Co. Chaco is operator of the Bolivian concession held by Tennessee Gas, Union Oil & Gas Corp. of Louisiana, Lion Oil division of Monsanto Chemical Co., and Murphy Corp.

Big Chief will start drilling in the western portion of the Madrejones concession, about 3 or 4 miles east of the Belgrano railroad.

The area is considered semiproved. It is believed to be an extension of the anticline which has oil and gas production in the Madrejones field on the Argentine side of the frontier. Twelve wells have been completed in Madrejones field by the Argentine Government. Pay formation is the Tupambi sand at approximately 14,000 ft.

Also, oil and gas reportedly were found on the Chaco concession when it was held by Glenn McCarthy (OGJ, June 10, 1957, p. 78).

The first rig for the Madrejones drilling is slated to be shipped from Houston the latter part of this month.

Top Oil Officials Shuffled

. . . in Argentine, Brazilian Government agencies. Frondizi aims at stronger support for YPF development contracts.

A SHAKEUP of top brass in the Argentine and Brazilian government oil industries has taken place—and for exactly opposite reasons.

Argentina's President Arturo Frondizi, who has been working hard to make his new oil policies stick, has installed a new board of directors in a move to reorganize YPF management and make it more efficient.

The new board will undoubtedly offer stronger support for the new contracts between the government and foreign companies. It is no secret that some YPF officials had bitterly opposed the deals being made with outside companies for development of oil resources.

Horacio Aguirre Legaretta, minister of labor under the recent provisional government, has been named chairman of the board. Three members are from the armed forces, and two are from the YPF technical staff. Each oil producing province has one member, and one member will be selected by the workers' union.

President Frondizi's personal delegate, Arturo Sabato, who had been managing YPF, has been made a director general with a vote on the board.

Petrobras changes . . . In Brazil, President Juscelino Kubitschek ended a hassle between the heads of Petro-

bras and the national petroleum council by replacing both of them.

The council's job is to plan for the government-run industry. Petrobras responsibility is to carry the plans out.

Ostensibly, the clash between Col. Alexinio Bittencourt, director of the council, and Col. Janary Nunes, director of Petrobras, was over charges that Petrobras was guilty of mismanagement and misuse of foreign exchange.

Bittencourt charged that these faults were threatening the whole program.

The disagreement arose, however, after Argentina started signing development contracts with foreign companies this year. Many Brazilians began asking whether the government's tight monopoly was best for the country after all.

President Kubitschek replaced Col. Bittencourt with Air Force Gen. Henrique Fleuiss. Col. Nunes has been succeeded by Col. Idalo Sardenberg. The president said that an investigation of Petrobras convinced him it was the best solution to the country's oil problem.

Monagas Reserve

is even better than first indicated. Area extended.

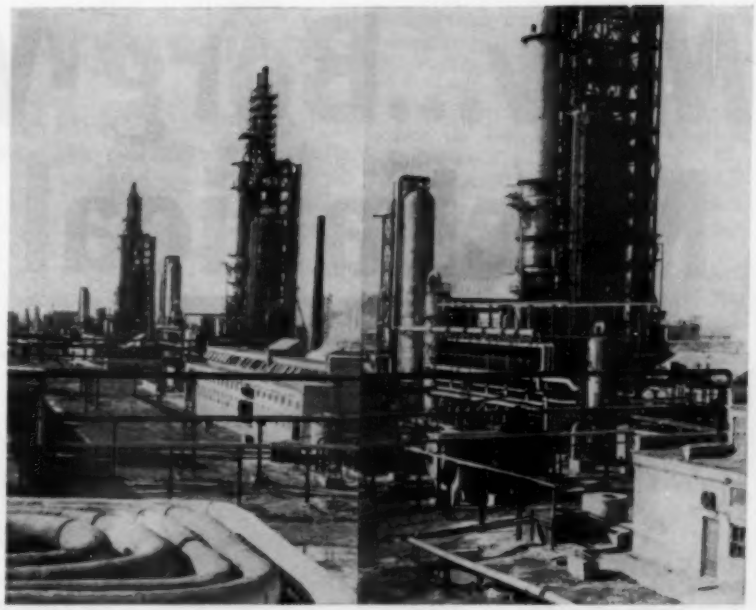
AN ENTIRE 25,000-acre tract in the Temblador area of southern Monagas is covered by a major low-gravity oil reserve proved in a six-well wildcat drilling program.

The discovery has been made by a group of six companies headed by Phillips Petroleum Co. Phillips had taken the wraps off the find after three wells (OGJ, Sept. 29, p. 52). But three more wells indicate the reserve is even better, covering all of the eastern Venezuelan concession.

Each of the wells is productive in Oficina sands between 3,200-4,500 ft. with net pay totaling about 350 ft. in most cases. The pumping and flowing potentials of the heavy crude is rated up to 1,200 bbl. daily.

Phillips has 55.75% in the concession. Others are Sunray Mid-Continent, 17.27%; Ashland Oil & Refining, 10.79%; Kerr-McGee, 5.39%; Western Natural Gas, 3.24%; El Paso Natural Gas, 3.24%; Pacific Petroleums, 3%; and Canadian Atlantic, 1.32%. The group paid $11,257,000 for the tract last year.

The same companies have also found prolific production on their Block 17 in Lake Maracaibo. The LPG 14-3 tests 6,000 bbl. daily of 33.8°-gravity crude (OGJ, Dec. 8, p. 68).



Red Refining Is Like Ours

. . . in many respects. Russians apparently have copied some techniques developed by American companies.

REFINING PROGRESS in the Soviet Union appears to be leaning heavily on American technology.

A quick look at the accompanying photo shows why. At first glance the three cat units appear to be Socony Mobil thermofor catalytic crackers. In fact, a detailed study of the photo marks the similarity as more than casual. The three units are cat crackers installed at the Novo-Kuibyshev refinery in the USSR.

No moving bed units such as the TCC have been licensed or shipped to Russia, but four Houdry fixed-bed units were ordered by the Soviet Union during World War II, and two of these were actually shipped. Some Houdry units were converted into moving bed units in the U.S., but these conversions involved the junking of the catalyst sections and utilization primarily of the feed-preparation facilities and gas-recovery sections of the existing units.

The Russians apparently have relied a great deal on published literature plus knowledge they picked up under wartime exchange agreements, such as the design of bucket elevator systems. They did build a synthetic bead catalyst plant, and this would fit into the over-all scheme.

Reports from behind the Iron Curtain indicate the Russians have embarked on a master plan to install similar units in 10,000 and 20,000-bbl. sizes in many of their planned refineries. They also are reported to be building fluid units.

The units in the photo appear to be 20,000-bbl. jobs on the basis of the size of the fractionation facilities. This is assuming the fractionation equipment is as efficient as that in use in this country. On this basis, the Novo-Kuibyshev plant would have a crude capacity in the neighborhood of 150,000 bbl.

"Thumper" to Work Abroad

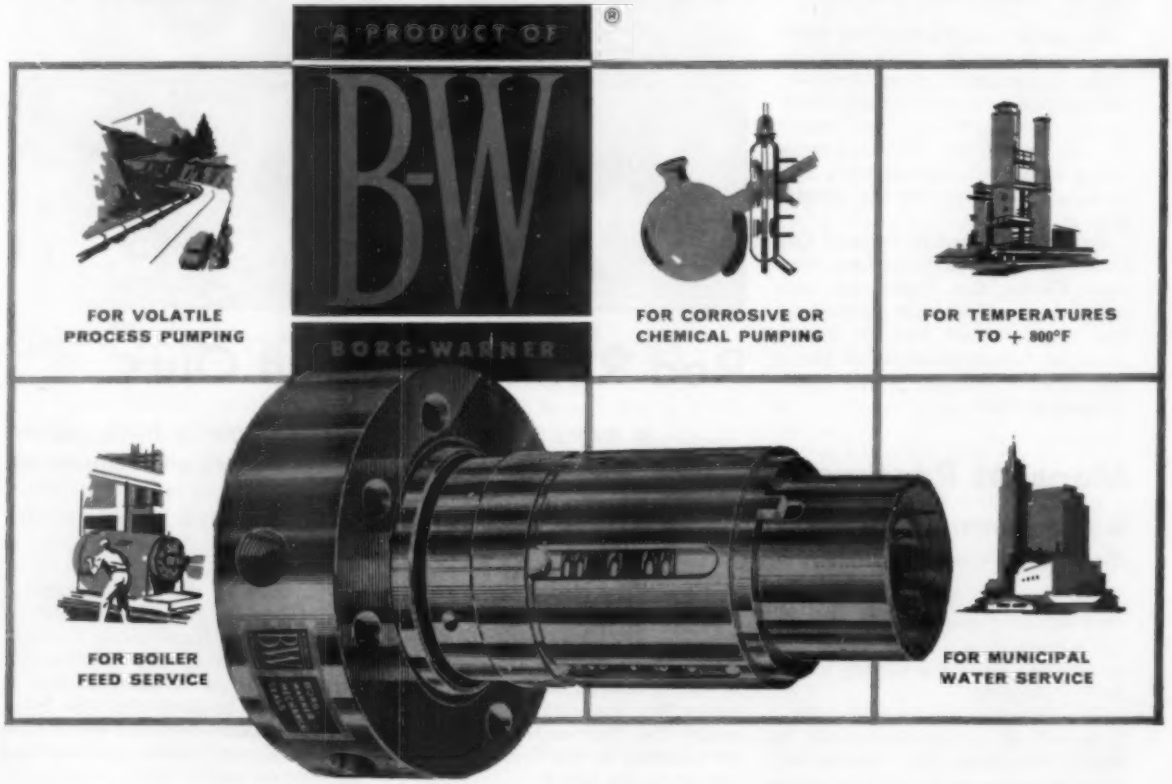
TWO HOUSTON geophysical companies have joined hands to exploit abroad the weight-dropping method of seismic exploration.

The McCollum Exploration Co. and Robert H. Ray Geophysical Co. have formed a third company to be known as McCollum-Ray International, Inc.

The new firm will make available to operators abroad the McCollum Geograph and furnish the crews to use the technique. The Geograph, known in the industry as the "thumper," records sound waves produced by the dropping of a weight.

Burton McCollum, president of McCollum Exploration and developer of the Geograph, will be chairman of the board of the new company, and Robert H. Ray, president of Robert H. Ray Geophysical, will be the president.

Now...Borg-Warner® Mechanical Seals



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Rigs Nearing Argentina

. . . for Mendoza development program. Banking firm forms new company and takes on two partners for venture.

THE FIRST two privately owned rigs for a $100-million development-drilling program in the Mendoza area of western Argentina are just about due to arrive in Latin America.

Shipment of the drilling equipment and plans to follow it up with five more rigs were disclosed last week by Carl M. Loeb, Rhoades & Co. At the same time the New York banking firm revealed it has taken on two new partners in the venture.

The entire operation will be headed up by Bruce Clardy, former Dallas and Houston independent and drilling contractor and former president of Service Pipe Line Co. He also is a former proration umpire and chief deputy supervisor of the oil and gas division of the Texas Railroad Commission.

Clardy is president of L. R. Development, Ltd., a Canadian company founded by the New York bankers to hold 63⅓% of the venture.

South American Development Co., a subsidiary of Signal Oil & Gas, will have 20% of the new venture, and Unola de Argentina, owned by Union Oil & Gas of Louisiana, will have the remaining 16⅔%.

The first two drilling units, a National 75 and a light truck-mounted unit, were shipped from Houston late in November, and were slated to arrive in Buenos Aires about December 20. They will be followed by four more National 75's and a second truck-mounted rig. A second shipment leaves Houston December 15 (Monday), and the third shipment is scheduled for December 26.

All the equipment will be operated by Kerr-McGee Oil Industries, Inc., under contract with the New York banking firm.

The banking firm negotiated one of the first two such development contracts with Yacimientos Petrolera Fiscales under the new program sponsored by President Arturo Frondizi, who is trying to develop the country's oil without actually granting conventional concessions.

The other was with Pan American International. Pan Am's contractor, Loffland Brothers, has already landed three rigs in the country and plans to ship seven more (OGJ, Dec. 1, p. 94).

Drilling plans . . . Pan Am plans to start its drilling next month in the Comodoro Rivadavia region, fairly near the Atlantic Coast.

The Mendoza program will take longer to get under way because the area slated for drilling is more than 600 miles inland.

Australian Search Gets Boost

. . . by two Dallas-based firms. Delhi slates initial test, and Cordillera Mining gets interest in huge concession.

DELHI AUSTRALIAN Petroleum, Ltd., has spotted location for a 14,000-ft. wildcat, its first in Australia, on a large anticline in northeastern South Australia.

The company, a subsidiary of Delhi-Taylor Oil Corp., Dallas, hopes to spud in the well in January.

The first shipment of casing and drilling mud for the venture left Houston November 28.

Delhi will drill its first well on a large subsurface dome in the Innamincka area near the South Australia-Queensland east border. The anticline was delineated and confirmed at depth by a combination of aerial photography, surface geology, and seismic work. It is about 40 miles long and 30 miles wide, with the long axis trending generally east-west. It is in the Great Artesian basin.

The Innamincka test will fulfil Delhi's early obligations under its concession sharing agreement with Santos, Ltd. Under this agreement, Delhi can acquire a half interest in a huge 267,000-acre concession in South Australia and Queensland by drilling to 14,000 ft. If Delhi wants to proceed further after this wildcat, it can make its half interest permanent by spending $500,000 a year for 4 years.

Delhi will have to operate with essentially no drilling data for correlation purposes. The only drilling of consequence on the dome or in the area is a 5,000-ft. water well on the north side of the anticline.

Other activity . . . While pushing the Innamincka operation, Delhi moved on another front to acquire still more concession acreage in Australia.

Together with Santos, Delhi applied for another concession taking in about 135,000 acres in the Gulf of Carpentaria on the northwestern coast of Queensland.

Another U. S. firm, Cordillera Mining Co., Dallas, and Grand Junction, Colo., is entering the Australian search.

Cordillera Mining acquired a half interest in a 12,000,000-acre oil and gas concession. The acreage extends through Queensland and is next to that owned by Santos and Delhi. Cordillera will be joint owner with Australian-American Oil Pty., Ltd. Cordillera will be operator.

James F. Martin, Cordillera president, said aerial surveys will be conducted later this month.

Marketing Company

formed by Indiana Standard for foreign oil operation.

WITH AN eye toward any production found on its concession off Iran in the Persian Gulf, Standard Oil Co. (Ind.) is setting up a world-wide marketing operation.

The company is forming a subsidiary which will buy, sell, trade, and transport crude oil and products on an international scale.

R. E. NELSON

The new company will be Amoco Trading Corp. Its president, effective January 1, will be Richard E. Nelson, Jr. Nelson is now director of operations in Indiana Standard's supply and transportation department in Chicago. Offices of the new company will be in New York. Foreign offices are to be opened later.

The wholly owned affiliate will deal in foreign crude oil and petroleum products anywhere in the world. The company will complement operations of other Standard affiliates, including Pan American International Oil Co. Pan American International nailed down the prize Iranian concession (almost 6,000 sq. miles) last May.

Nelson's oil experience dates back to 1929 when he joined Dixie Oil Co. as geological scout in West Texas. He later served two Indiana Standard affiliates, Pan American Petroleum Corp. and Service Pipe Line Co., before moving to Indiana Standard's Chicago headquarters in 1950 as general manager of crude oil supply and products pipelines.

Chemicals in drilling mud

. . . why, where, and when they're added, and a look at some figures on costs

BY DR. GEORGE R. GRAY
Drilling Fluids Corp., Houston

THE DRILLING-MUD industry is a development of the last 30 years. As the rotary method of drilling increased in popularity following discovery of oil at Spindletop in 1901, mud began to get attention as a carrier of drilled cuttings. Sticky surface clays from nearby deposits frequently were used to make mud.

In the early twenties B. K. Stroud[1] showed that iron oxide and barium sulfate could be used to raise the density of mud higher than was possible with clay. Shortly thereafter the commercial drilling-mud industry came into being with the sale of barite and hematite as weighting materials and the sale of bentonite as a suspending agent.

Viscosity-reducing agents or thinners came into use in the early thirties. Then came starch to improve the sealing properties of the mud, oil-base and emulsion drilling fluids, and special treating agents. The list of commercial mud materials has continued to increase until mud suppliers today list 25 to 50 products. A great many more materials have been proposed or have been used in limited amounts. Over 500 United States patents have been issued on products and processes related to drilling fluids.

Even though the total expenditure for materials used in drilling fluids approached $150,000,000 in 1957, a great many wells were drilled without the use of a significant amount of purchased mud. Probably 80% of the cost was on 20% of the wells. Air or gas was the drilling fluid for a considerable number of wells. Shallow wells often require but little more than water, and mud costs are

a minor part of the cost of the well.

In the past 5 years there has been an increase in the number of wells drilled below 15,000 ft. At such depths the mud costs account for a large portion of the total cost of drilling. Thus, in 1953, 26 wells were drilled below 15,000 ft. with the average mud cost of $75,000 amounting to 10.3% of the total cost. In 1957, 199 wells drilled to below 15,000 ft. had an average mud cost of $121,000, accounting for 16.3% of the total cost.[2] Three-fourths of the wells drilled to depths below 15,000 ft. were in the Gulf Coast region of Texas and Louisiana.

With increase in depth, expenditures for mud materials increase more rapidly because of the great hazards involved and the higher potential losses.

Drilling areas differ . . . There are characteristic differences between the drilling conditions in the Gulf Coast and in the interior. In the interior of the United States the rocks are hard and the fluids in the formation are under normal or below-normal pressures. Along the Gulf Coast both inland and offshore, thousands of feet of soft sediments are drilled. Structural conditions are such that abnormally high pressures are not unusual.[3]

Table 1 lists the percentage distribution of mud costs on about 2,200 wells. It shows that in the interior about two-thirds of the costs is distributed among clays, organic filtration-reducing agents, and chemical thinners, while in the Gulf Coast barite weighting material accounts for the same fraction of the total cost.

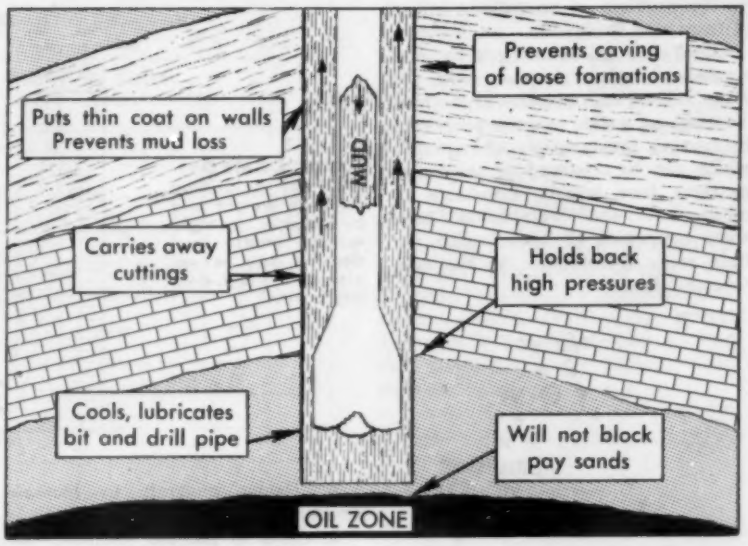
TABLE 1—DISTRIBUTION OF MUD COSTS ON 2,200 WELLS

	Percentage of total mud costs	
	Interior	Gulf coast
Barite weighting material	9	64
Bentonite and other clays	22	4
Organic filtration-reducing agents	25	9
Chemical thinners, emulsifiers, etc.	32	17
Lost-circulation materials	12	6

Broad generalizations are unsafe when applied to limited areas. Even in the same field mud costs may vary greatly from well to well because of such factors as occurrence and depth of abnormal pressures, loss of circulation, soluble salts, etc.

Why Drilling Fluids Are Used

Lifting cuttings . . . Primary function of drilling fluids is to remove bit cuttings from the hole. Carrying capacity depends on viscosity, gelation, and density of the drilling fluid and on the velocity of the drilling fluid in the annulus between the wall of the hole and the drill pipe. Thus a much higher velocity is needed when gas is the drilling fluid than when a dense mud is used.


Prevents caving of loose formations
Puts thin coat on walls Prevents mud loss
MUD
Carries away cuttings
Holds back high pressures
Cools, lubricates bit and drill pipe
Will not block pay sands
OIL ZONE

DRILLING FLUID has several important jobs to do.

Controlling well pressures . . . A second important function of the drilling fluid is to keep the fluids in the formation from entering the well. Blowouts, caused by the uncontrolled flow of gas, oil, or salt water into the hole, are prevented by keeping the hydrostatic pressure of the mud column in excess of the fluid pressure in the formation. Not infrequently the hydrostatic pressure must be 1.5 times that of water. In areas of high formation-fluid pressures, the density of the mud often is as high as 1.8 and sometimes is as high as 2.3.

Forming a filter cake . . . Another job of mud is to seal porous rocks so that the mud is not lost into the formation. Circulation is lost when the openings in the rock are large enough to allow the whole mud to enter. Particles of large size are added to bridge the openings, or cement or other materials are introduced to solidify in the voids.

If the openings in the rock are too small for the mud solids to enter, the solids filter out on the face of the rock, forming a cake, and only the liquid from the mud enters the pores. The permeability of this filter cake then determines the rate of loss of liquid from the mud to the porous formations.

Other important jobs . . . The drilling fluid is important to the success of drilling, logging, testing, and completing a well. Mud properties affect the drilling rate in clearance of cuttings and applying pressure to the rock. Mud holds gravel and loose sand in place and prevents caving of shale. Mud must be specially treated to prevent hole enlargements from washouts and caving, or from dissolving soluble salts. Mud cools the bit and lubricates the drill string.

Effect on other operations . . . The type of mud used can affect the information that can be gained from such logging methods as examination of cuttings and cores, mud analysis, and electric logging. The drilling fluid transports shows of oil and gas to the surface. Invasion of porous formations by mud filtrate is an important factor in electrical logging.

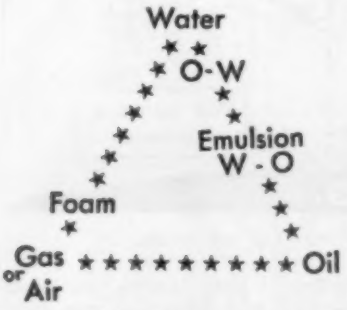
Prime purpose in drilling a well is to test and complete it successfully. Mud properties must be considered in running testing tools into the hole, making tests, landing casing, cementing, and perforating. For example, thick filter cake on sand may cause testing tools to stick and may interfere with landing and cementing casing. Production from the well may be affected by the invasion of the producing formation by mud or filtrate. It can also be affected by the reaction of the filtrate with the constituents of the formation.

Composition of Drilling Fluids

The drilling fluid circulated to remove cuttings from the hole may be gas, or liquid, or both. It may contain dissolved or suspended solids. Drilling is faster and bit life longer with gaseous instead of liquid drilling fluids. But, the use of gas is limited

by the problem of controlling influx of formation fluids.

Gases used are natural gas, air, and combustion gases. Liquids used are water and oil and mixtures of the two. You can get a wide range in properties by using a great variety of materials which can be dissolved or suspended in these base liquids. Emulsions of oil-in-water and water-in-oil have some properties of both liquids but bear more resemblance to the continuous phase.

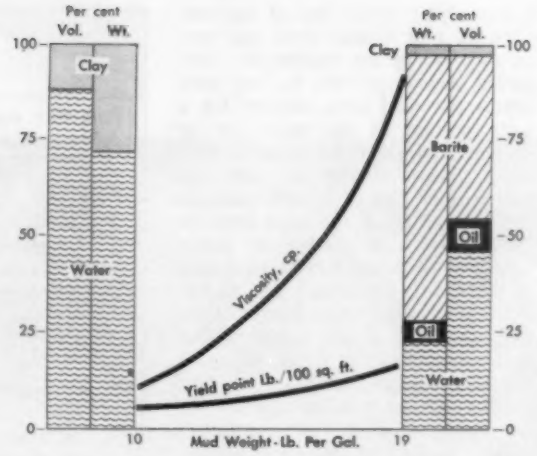


A COMBINATION of oil and water forms emulsions. Concentration of oil and water and type of emulsifier determine whether the emulsion is water-in-oil or oil-in-water. Amount of air or gas in water determines whether mixture is foam or aerated water.

Most wells are drilled with water-base mud. But, water-base muds range in composition from slightly dirty water to heavily weighted, chemically treated, oil-in-water emulsions. Cost has a similiar spread; it may be that of the cost of water alone to as much as $30 per barrel. Composition of the drilling fluid usually is determined by economics, the drilling equipment available and previous experience in the area. Rarely is unsatisfactory performance of the drilling fluid due solely to inability of the mud engineer to devise a suitable formulation. More commonly, difficulties arise from the necessity for compromises among the factors influencing the mud program.

Effect on mud properties . . . We will consider the chemical products from the standpoint of applying them to get certain properties in the drilling fluid, rather than on the basis of chemical relationship. Often a substance is added to bring about a change in one property and, at the same time, it changes other properties, either favorably or unfavorably. For example, adding bentonite as a suspending agent improved hole conditions by reducing filtration before we recognized the importance of filter cake and devised methods of testing for it.

This article will discuss chemicals for drilling fluids in these applications:



TOTAL COMPOSITION of a drilling fluid by weight and by volume. In high-weight muds, low-density clay is replaced by high-density barite.

1. Heavy minerals to increase density.
2. Clays to provide viscosity, suspension, and sealing qualities.
3. Plugging agents to prevent loss of whole mud into formations.
4. Dispersants to control flow properties and gel development, and, secondarily, to serve as emulsifiers to reduce filtration.
5. Organic colloidal materials to reduce filtration regardless of the presence of soluble salts.
6. Substances to counteract contaminants met in the course of drilling.
7. Emulsifying agents.
8. Products to effect specific characteristics, such as release of gas, prevention of corrosion, lubrication, etc.
9. Oil-base drilling fluids.

Heavy Minerals to Increase Density

Preventing blowouts is one of the most important functions of the drilling fluid. The density of the mud can be raised by adding any heavy mineral that does not react with other constituents of the mud. Minerals that have been used include galena, ferrophosphorus, ferrosilicon, magnetite, hematite, barite, and celestite. Calcite and shell flour are sometimes used in oil-base drilling fluids although they have a specific gravity of only 2.7.

Barite . . . The only mineral used in significant amounts at present is barite. Barite is readily available in large quantity, is easy to grind, and is low in cost compared to heavier minerals. Barite for use in drilling mud ranges in specific gravity from 4.0 to 4.3. Usual impurities are silicate minerals and calcite. It is ground so that 90-95% passes 325-mesh screen.

Barite is used in all muds weighing more than 11 lb. per gal. and in many lighter muds. The quantity of barite used in drilling fluids exceeds by far the sum of all other additives, and in cost amounts to nearly half of the total cost of mud materials. In deep wells where heavy muds are required to control abnormal pressures, barite accounts for as much as 80% of the mud cost. The Gulf Coast region of Louisiana has the greatest average well depth (10,480 ft.) and the highest consumption of barite, roughly 800,000 tons in 1957.

Quantities of barite used in oil-well drilling according to Mineral Industry Surveys, United States Bureau of Mines, are shown in Table 2.

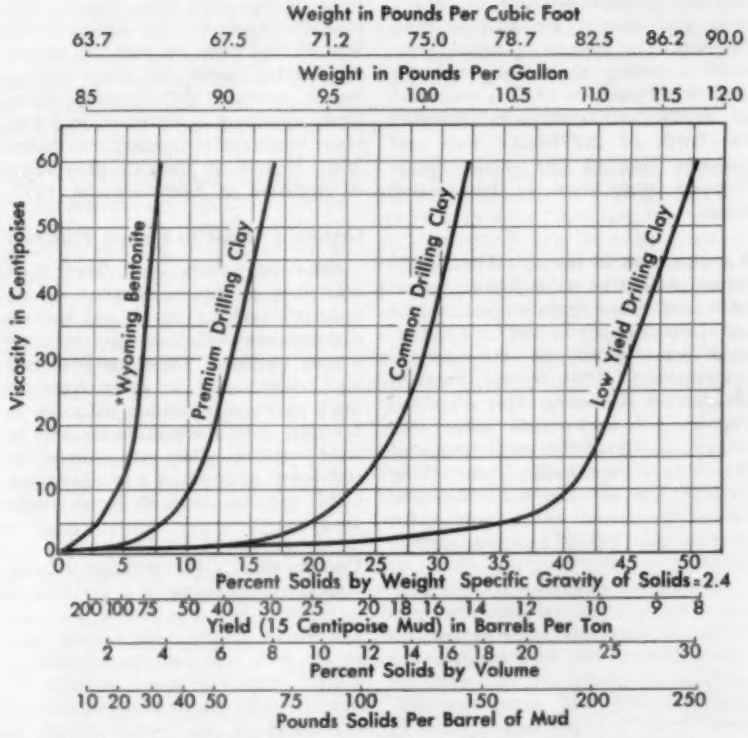
TABLE 2—BARITE USED IN OIL-WELL DRILLING

Year	Tons barite sold for use in mud	Per cent of total barite used in mud
1952	758,240	90
1953	824,050	90
1954	968,429	94
1955	1,142,309	93
1956	1,421,033	95

There was some reduction in drilling in the Gulf Coast region in 1957. This and increased use of centrifuges to recover barite from mud made consumption of barite in 1957 less than in 1956. It is estimated at 1,300,000 tons.

Clays

In the majority of U. S. wells, clays are the most significant constituent affecting the properties of the drilling fluid. In water-base muds, clays generally supply suspending and sealing qualities. Purchased clays are often used in starting the well. Clays from the formations drilled make up the major solid component of many muds. Some formations do not provide suitable mud-making clays and commercial clays are added throughout the course of drilling. Added chemicals act either directly upon the suspended clay or by alteration of the ionic environment.


Weight in Pounds Per Cubic Foot
63.7 67.5 71.2 75.0 78.7 82.5 86.2 90.0
Weight in Pounds Per Gallon
85 90 95 100 105 110 115 120
Viscosity in Centipoises
*Wyoming Bentonite
Premium Drilling Clay
Common Drilling Clay
Low Yield Drilling Clay
Percent Solids by Weight Specific Gravity of Solids = 2.4
Yield (15 Centipoise Mud) in Barrels Per Ton
Percent Solids by Volume
Pounds Solids Per Barrel of Mud

*A good salt clay in salt water approximates the bentonite yield curve in fresh water.

TYPICAL CLAY-YIELD CURVES taken from "Principles of Drilling-Mud Control" published by Petroleum Extension Service of University of Texas.

Bentonite . . . The principal clay used is bentonite. Bentonite for drilling mud comes mainly from the Black Hills region of Wyoming and South Dakota. Sodium montmorillonite is the major constituent of bentonite. Bentonite from these states is characterized as a "high-yield" clay (i.e., based on laboratory tests, 1 ton of clay will yield 100 bbl. of mud having an apparent viscosity of 15 cp.[4]). According to Mineral Industry Surveys, United States Bureau of Mines, the quantities of bentonite used in drilling muds in recent years was as shown in Table 3.

TABLE 3—BENTONITE USED IN DRILLING MUDS SINCE 1952.

Year	Tons of bentonite sold for use in mud	Percent cent of total bentonite used in mud
1952	705,280	50
1953	583,373	46
1954	548,300	43
1955	595,471	40
1956	628,146	40

The quantity of bentonite used in mud in 1957 is estimated at 500,000 tons. The increased use of emulsions of oil in water and the emphasis on "low-solids" muds has decreased the use of bentonite in relation to other mud materials. Cost of bentonite amounts to from one-fifth to one-half of the total cost of mud materials in areas where muds weighing up to 10 lb. per gal. are adequate for control of pressures. Where heavily weighted muds are required, bentonite cost amounts to 2 to 5% of the total, and most of the bentonite is used in the shallower part of the hole.

Other clays . . . About 35,000 tons of "low-yield" (20 to 50 bbl. per ton) clays is sold from local deposits in the vicinity of drilling operations. Many of these clays are principally calcium montmorillonite and often are blended with 1 to 3% of soda ash to increase the yield and reduce filtration. Polyacrylates can be added to calcium bentonite along with soda ash to produce a clay approaching sodium bentonite in performance.

Bentonite is not an effective thickening and sealing agent in salt water. Attapulgite clay (fuller's earth) is used as a suspending agent when mud is made with salt water. Attapulgite clay furnishes gel strength and viscosity but does not reduce filtration like bentonite does in fresh water. Organic colloidal materials such as starch and sodium carboxymethylcellulose are used to control filtration of salt water muds.

Attapulgite is a hydrous magnesium aluminum silicate that has a fibrous structure. Attapulgite is mined in southwestern Georgia and northwestern Florida. The clay is processed by pugging, extruding, and partially drying before grinding. The amount of attapulgite clay used in drilling muds in 1957 is estimated at 70,000 tons.

Lost-Circulation Materials

Drilling fluids may be lost to cavernous limestone, gravel, and faulted, jointed, and fissure formations. Fissures may be present naturally in the formation, or they may be produced by pressure of the drilling fluid.

To stop loss of mud, material large enough to bridge or plug the opening is introduced, or a cementing material is pumped in. A great variety of such substances have been used.[5] Lost-circulation materials may be roughly classified as (1) flaky, such as mica, cellophane, and vermiculite; (2) fibrous, such as cottonseed hulls, bagasse, flax straw, shredded wood and bark, and leather; and (3) granular, such as ground nut hulls, perlite, ground plastic scrap, and crushed rock.

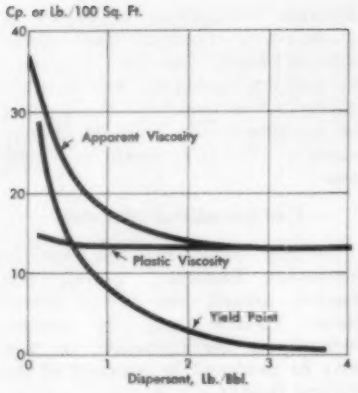
The cementing materials include mixtures of portland cement and bentonite, plaster of paris, sodium silicate and clay, clay cement, and some plastic compositions. Bentonite-in-oil forms a stiff mass when mixed into the water or mud in the hole. Among the less commonly used products are hog hair, feathers, fish scales, ground corn cobs, coke, and crushed gilsonite. Almost any bulky material that can be found in or near oil fields has been tried.

In oil-producing areas, cost of lost-circulation materials ranges from 1 to 25% of the total cost of mud materials. The expenditure for lost-circulation materials is estimated to be between $12,000,000 and $15,000,000 per year.

Dispersing Agents or "Thinners"

The economical control of the flow properties of drilling muds is dependent on the action of dispersing agents, or "thinners" as they are commonly called. Thinners serve several purposes. Viscosity and gelation are reduced and more solids can be incorporated in the mud before it becomes objectionably thick. Rate of filtration is lowered because of deflocculation of the clay. Thinners make possible the addition of barite to raise the density without the necessity for extensive dilution. They counteract the effect of flocculents in the formations drilled. They aid the emulsification of oil.

The thinners in common use fall



ACTION of dispersing agents or "thinners" on drilling fluid. With increasing amounts of dispersant, viscosity and gel strength are reduced. Dispersants also lower filtration rate, deflocculate clays, and facilitate addition of barite to the mud.

into four groups: (1) plant tannins, (2) lignitic materials or humates, (3) lignosulfonates, and (4) complex phosphates. These dispersants have a common characteristic in furnishing a large anion. These large anions are adsorbed on specific surfaces of clay particles and decrease the tendency of the particles to develop a gel structure.[6] Hydration of the clays is changed little.[7] The effect on resistance to flow is largely on the yield point while plastic viscosity is affected only slightly.[8]

Quebracho . . . The plant tannin used in greatest amount is quebracho extract. It was the first thinner used in large amounts and is still the standard of reference for performance. It is more widely applicable than any other thinner on the market. Most quebracho extract comes from Argentina. The dry product contains 60 to 70% tannin. For oilfield use, the extract frequently is ground with 10 to 40% of lignite or some noncaking tannin material.

The quantity of quebracho used in drilling mud in 1957 is estimated at 18,000 tons. There has been little change in the amount of quebracho used in recent years although the consumption of other thinners has increased. Domestic sources of tannin products used as thinners include Douglas fir, redwood, hemlock, chestnut, and pecan. Other foreign sources include Australian eucalyptus, cutch, mangrove, tara, wattle, and myrabolans. The amount of these tannins used in mud is estimated at about 5,000 tons in 1957.

Caustic soda often is used along with tannin materials. Proportions range from equal parts to one part caustic soda to five parts tannin. Both liquid and dry reaction products of caustic soda and tannins are sold as mud thinners. The amount of caustic soda used in drilling muds along with the organic thinners in 1957 is estimated at 25,000 to 30,000 tons. Roughly two-thirds of the caustic soda and possibly half of the total organic thinners were used in lime-treated muds.

Lignites grow in use . . . The lignitic material referred to as lignite, humic acid, and mined lignin was introduced as a mud thinner in 1947. A restriction was placed on the use of quebracho in 1951 by the National Production Authority. This promoted the use of lignite and other substitutes and by 1952 the amounts of lignite and quebracho were about equal.[9] The use of lignite has continued to increase; and it is estimated that at least 25,000 tons was used in 1957.

The lignitic material that is effective as a thinner and emulsifier is produced by strip mining of deposits in North Dakota and New Mexico. The material is placed in stockpiles for partial drying and some oxidation, then dried to a moisture content of 15 to 20%, ground, and bagged.

Lignite is less acidic than quebracho. Caustic soda is often used in the proportion of 1:5 lignite. Dry reaction products of caustic soda and lignite are prepared by evaporating a solution of caustic soda and lignite and by grinding the two materials together. These products dissolve readily in water in contrast to the untreated lignite.

Lignosulfonates . . . Lignosulfonate dispersants are made from the spent cooking liquor byproduct of the manufacture of cellulose pulp by the sulfite process. Basic calcium lignosulfonates are precipitated from the liquor. These serve as the starting point for various modifications that are identified as the calcium, sodium, and ferro-chrome lignosulfonates. Calcium lignosulfonate has been used extensively as a dispersant in lime-treated muds.[10] Sodium lignosulfonate has had very limited use to emulsify oil in salt-water mud. Ferro-chrome lignosulfonate is an effective deflocculant for gypsum-treated muds.[11] The amount of lignosulfonates used in drilling mud in 1957 is estimated at 9,000 tons.

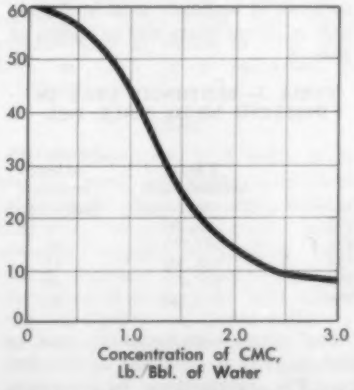
Phosphate use low . . . The molecularly dehydrated phosphates and the crystalline and glassy polyphosphates are effective deflocculants for clays.[12,13,14] In the late 1930's the complex phosphates were about one-third of the total thinner used. The available supply was low during World War II and after the war the use of lime-treated muds for deep drilling greatly reduced the demand. Phosphate treatment is restricted to fresh-water muds and to temperatures below 200° F. Use of complex phosphates is estimated at 5,000 tons in 1957.

Organic Colloids to Reduce Filtration

Salt-water muds and other flocculated muds require colloidal organic materials such as starch and sodium carboxymethylcellulose to improve sealing qualities. These materials are also widely used in other types of muds to attain maximum reduction in filtration with a minimum increase in solid content. They are helpful in stabilizing oil-in-water emulsions. CMC often is used to increase viscosity.

Cornstarch . . . The principal organic colloid used is starch. It is available in large quantities at relatively low cost. Cornstarch pasted with caustic soda at the well was used successfully in 1939[15] and was soon replaced by pregelatinized starch that required no processing at the well.[16] Starch is added directly to the mud through the mixing hopper in amounts ranging from 1 to 10 lb. per bbl. of mud. The amount of starch used in drilling muds in 1957 is estimated at about 23,000 tons.

Whenever starch is added, measures must be taken to prevent fermentation. The antifermentation treatment must be continued as long as starch is in the mud. Fermentation is prevented by maintaining the pH of the mud at about 12, or by saturating the water with salt, or by using a poison. Several germicides have been used, e.g., para-



SODIUM CARBOXYMETHYLCELLULOSE (CMC) as a filtration reducing agent. CMC does not ferment as does starch and requires no special preservatives. It comes in high, medium, and low-viscosity grades.

formaldehyde, sodium pentachlorphenate, cresols, and phenols. Paraformaldehyde is used in largest amount. It is estimated that 1,500 tons of paraformaldehyde was used in muds as a starch preservative in 1957.

CMC . . . About 1945, sodium carboxymethylcellulose (CMC) came into use as a filtration-reducing agent[17,18] and has steadily grown in favor. CMC does not ferment under ordinary conditions. Consequently, it does not require special preservatives. CMC is more expensive than starch but less is used per barrel of mud, ordinarily 0.2 to 2 lb. per bbl.

CMC is furnished in both pure and technical grades and in high, medium, and low-viscosity classes. For most applications the medium-viscosity product is preferred. In recent years the high-viscosity grade CMC has been used to give suspending properties to low-solids muds and oil-in-water emulsion drilling fluids. Faster drilling rate is possible with drilling fluids of low solid content.[19]

The low-viscosity grade is favored for continued use in heavily weighted muds but the high-viscosity grade sometimes is used to suspend barite in freshly prepared high-density muds. The total quantity of CMC used in drilling muds in 1957 is estimated at about 5,000 tons.

Natural gums . . . Among the first of the organic colloids to be used in the field were natural gums.[15,20] Tragacanth, arabic, ghatti, and karaya gums had very limited use because supply and costs became uncertain with the outbreak of World War II. In recent years some guar gum has been used to reduce filtration (although more commonly used to bring about flocculation). Interest has revived in gum dextran, a product formed by the action of certain bacteria on crude sugar.[21]

Synthetic polymers . . . Much research has been directed to applying synthetic polymers to drilling muds. Some products have been designed specifically to reduce filtration rate of both fresh-water and salt-water muds without an increase in viscosity and gel properties. An example is a condensation product of sulfonated phenol and formaldehyde[22,23], and the sodium salt of sulfonated polystyrene.[24] Various vinyl polymers have been proposed and a few have been used in the field.

Alkali metal salts of polymers of acrylic acid, hydrolyzed polyacrylonitrile, and related compounds[25,26] are more stable to heat than starch or CMC. Before the polyacrylates can be generally applied in mud, products must be developed that are unaffected by calcium ion. About 350 tons of polyacrylates was used in drilling mud in 1957.

Chemicals to Counteract Contaminants

Any substance that adversely affects the properties of the drilling fluid is referred to as a "contaminant." The same substance may be either a contaminant or a desirable constituent depending upon the type of drilling fluid and the concentration of the substance. For example, gypsum is a contaminant for fresh-water muds but an essential component of "gyp" muds. Water is a contaminant for most oil-base drilling fluids but a desirable constituent of water-in-oil emulsion fluids up to a limiting concentration beyond which it becomes a contaminant.

Treatment to counteract contaminants may involve reaction with the contaminant or with other components of the mud, or change in composition to a type of mud that will tolerate the contaminant.

Shale . . . In the Gulf Coast region deep wells drill thick beds of shale. There is thickening of mud caused by dispersed shale particles and sticking of tools by sloughing shale fragments. Easily dispersed, mud-making shales aggravate the problem of viscosity control of weighted muds. The heaving-shale problem so prevalent in the thirties has greatly diminished with improvements in drilling mud, equipment, and practices.

. . . Lime treatment. A major factor in the decrease in difficulties in drilling Gulf Coast shales has been the use of lime-treated muds.[27,28,29] Lime-treated muds are characterized by low viscosity and low gel strength. Hydration and dispersion of shale are reduced in lime-treated muds.

Ordinary fresh-water muds are converted to lime-treated mud by adding for each barrel of mud: 1 to 3 lb. of caustic soda, 1 to 3 lb. of organic thinner (tannin, lignite, lignosulfonate, or combinations of these) and 1 to 8 lb. of lime. Often, diesel oil (6 to 12% by volume) is also added. Filtration can be further reduced by the addition of starch, CMC, or both.

While drilling the mud is treated by regular addition of the amounts of these materials needed to maintain satisfactory properties, including alkalinity and lime content.[30]

The quantity of lime used in lime-treated muds in 1957 is estimated at 25,000 tons. The amount of caustic soda and organic thinners used in lime-treated muds cannot be estimated with any degree of certainty but possibly 15,000 to 20,000 tons of caustic soda and 25,000 to 30,000 tons of organic thinners were used in this type of mud.

Higher calcium-ion concentrations than can be had in the usual lime-treated muds are more effective in reducing disintegration of shale cuttings and swelling of the dispersed particles.[29] Calcium chloride and calcium sulfate are employed to provide higher calcium-ion concentrations than does lime. Lignosulfonates are used as thinners.[31] So-called gyp muds are not strongly alkaline and consequently do not solidify in hot holes as lime-treated muds are liable to do.[11,32] The quantities of calcium chloride and gypsum used last year to stabilize shale are not known but are estimated at about 1,000 tons of each.

. . . Alkalies and salts. Various alkalies and salts have been used to prevent dispersion and swelling of shales. Among these are the chlorides of sodium calcium and zinc;[33] sodium nitrate and potassium chloride;[34] sodium silicate;[35,36,37] caustic soda;[38] and barium hydroxide.[39]

. . . Surfactants. A different approach to the prevention of shale dispersion has been the application of nonionic surfactants.[40] The surfactant is effective in aggregating clay and is stable to electrolytes and temperatures likely in deep drilling. A 30-mole ethylene oxide adduct of phenol is the primary surfactant. Calcium sulfate or sodium chloride aids in retarding dispersion of shale. Filtration control depends on emulsified oil and on CMC or sodium polyacrylate. The surfactant-treated mud is quite stable in hot holes.[41]

Cement . . . Often, when casing is set, cement contaminates the mud. To overcome the contamination of fresh-water muds, they are treated by removing calcium ion, reducing pH, and dispersing the clay aggregates.[42] Materials commonly used are sodium bicarbonate, sodium acid pyrophosphate, quebracho, and lignite.

No reliable estimate can be made of the amounts of the dispersants already discussed that are used to counteract cement. About 1,000 tons of sodium bicarbonate is used annually for this purpose.

Salt . . . Salt can enter the mud: (1) when sands are drilled which carry salt water under pressure greater than that of the mud column; (2) when rock salt in beds or domes is penetrated, and (3) when salty water is used as mixing water. There is no chemical treatment for removal of salt. If the chloride ion concentration does not exceed 10,000 p.p.m., treatment with caustic soda and organic dispersing agent is adequate.

Lime-treated mud will tolerate higher concentrations of salt, up to about 30,000 p.p.m. Filtration is controlled by CMC or starch.

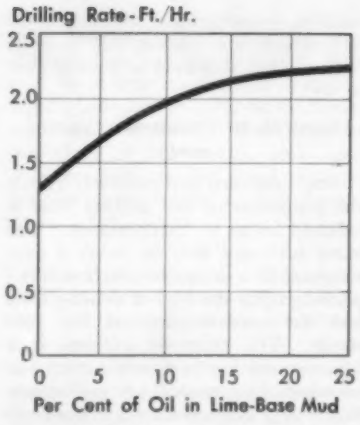
If solid salt is to be drilled the water in the mud should be saturated with salt before the salt is drilled to avoid the formation of solution cavities. Saturation should be maintained as long as the salt section is exposed in the hole.[43] In saturated salt water, attapulgite clay provides suspending properties and starch regulates filtration. As much as 100,000 tons of sacked salt was used in drilling last year in addition to a large volume of saturated brine.

Anhydrite . . . Calcium sulfate may be found as thin veins in shale, as stringers in limestone, or as beds of anhydrite, and may also enter the mud in "gyppy" makeup water. The treatment depends on the extent of contamination and the type of mud in use. Soda ash is the common treatment for gyppy water and small amounts of anhydrite. About 12,000 tons of soda ash was used in mud in 1957.

Another treatment consists in the addition of barium carbonate to react with calcium sulfate to eliminate the contaminant.[44] Consumption of barium carbonate in mud in 1957 is estimated at 2,500 tons. In the commonest treatment, caustic soda and quebracho or lignosulfonates are used to control flow properties, and starch or CMC is used to control filtration. Lime-treated or gyp muds[45] are not affected by anhydrite.

Emulsifying Agents

Emulsion muds make possible faster drilling rates with less hole trouble than muds not containing oil.[46 47] By emulsion mud is meant any water-base mud containing oil and an emulsifying agent. While the addition of oil improves performance, the chemical characteristics of the mud remain largely those of the original mud, whether lime-treated, salt-water, or other. Filtration is decreased and viscosity is raised somewhat.



EMULSION MUDS make faster drilling rates possible. This curve is taken from data obtained in laboratory tests with shale cores under pressure. (From Conningham and Goins.)

Emulsions may be stabilized by agents added specifically for that purpose, or by materials added to the mud primarily for other purposes. In the latter category are tannins, lignite, lignosulfonates, starch, and CMC. Lignosulfonates often are added specifically as emulsifying agents,[48] as are the caustic-lignite reaction products.

The group of specific emulsifying agents includes sodium salts of tall oil, sulfonated hydrocarbons, and a number of nonionic surfactants, principally polyoxyethylene esters and ethers.

Use of nonionic surfactants has increased rapidly since the introduction of a drilling fluid designed for drilling in hard rock and low-pressure areas. This drilling fluid consists of water containing 4 to 8% by volume of oil emulsified with a nonionic surfactant and a little high-viscosity-grade CMC.[49 50] A 30-mole ethylene oxide adduct of nonyl phenol that was first used in surfactant-treated mud[40] is being used as an emulsifier in low-solids muds not containing the primary surfactant.

The amount of specific emulsifying agents used in drilling muds in 1957 is estimated at 1,200 tons.

The majority of muds used in deep drilling contain 6 to 12% by volume of oil. In most wildcat wells and in field wells where only light crude oils are available, diesel oil is purchased. The amount used annually is large, possibly as much as 1,500,000 bbl. Where suitable crude oil is produced locally it is used in field-development wells. No estimate can be made of the quantity of crude oil consumed in drilling fluids but the amount probably is at least equal to the volume of refined oil.

Products for Special Applications

Lubrication . . . One of the factors given credit for the better performance of emulsion muds is improved lubricating properties.[51] The presence of oil is sometimes objectionable because of the possibility of confusion in the interpretation of oil stains on formation samples.

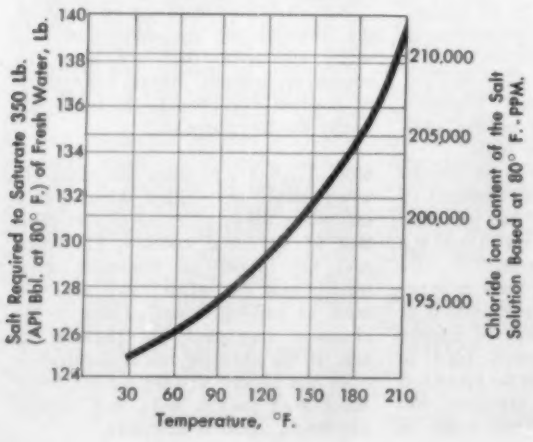
Graphite has been used to improve the lubricity of muds.[52] Usual treatment is 3 to 6 lb. per bbl. of mud. Graphite used in mud in 1957 is estimated at 1,200 tons.

Extreme-pressure additives to improve the lubricating properties of muds are now undergoing field tests. These additives are reported to increase the life of the bearings in rock bits, lessen wear on drill pipe, and reduce torque.[53]

Flocculation of solids . . . Where the formation permits drilling with water rather than mud, the rate is faster the smaller the amount of drilled solids retained in suspension. Sometimes mud density must be held to a minimum to prevent loss of circulation. If the drilled solids do not separate at the surface a large volume of water is needed. Water may be scarce and transportation costs high. In such cases treatment to cause rapid settling of solids can save by improving drilling rate. Treatment can also save on water and on salt when drilling with saturated salt water.

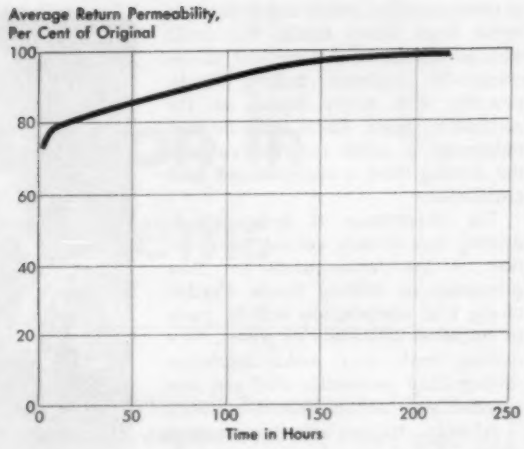
Guar gum flocculates suspended solids from saturated salt water.[54] Treatment with 0.2 to 0.5 lb. of guar gum per barrel of drilling water is begun while the solid content is low. The dirty water is circulated through the reserve pit to allow longer time for settling.

More rapid flocculation is brought



A MUD used to drill solid salt should be saturated with salt beforehand to prevent cavity formation. A mud saturated at 80° F. can dissolve still more salt at elevated drilling temperatures.

"As more is learned about how mud is lost to the formation, there should be improvements in the products and processes for stopping the loss . . . If we can reduce the possibility of loss of the drilling fluid, we could economically use and reuse materials of high initial cost."



A RETURN - PERMEABILITY curve for a typical oil zone drilled with oil-base-emulsion mud. The oil-base mud is used in formations where filtrate from water-base muds cause a permanent reduction in permeability.

about at lower concentration by an acrylamide-carboxylic acid copolymer.[55] Other synthetic flocculants are under investigation. In addition to savings from reduced consumption of water, bit wear is decreased and drilling time is lowered.

Corrosion inhibition . . . Corrosion of the drill string sometimes becomes serious, especially when salty or aerated drilling fluids are used. Corrosion in aerated drilling fluids usually can be controled by keeping the water saturated with lime. Sodium chromate or bichromate is commonly used to inhibit corrosion in salt-water muds. About 200 tons is used annually for this purpose.

Some of the surfactants employed primarily as emulsifiers in oil-in-water drilling fluids also inhibit corrosion.

Breaking of foam . . . Muds made with salty water commonly have foam on the surface of the mud in the pits. Some treating agents also tend to stabilize foam. At times air is entrained to such an extent that the drilling fluid becomes difficult or impossible to pump. This, then, calls for a foam-breaking agent.

Trial at the well often is the only way to determine what product will be effective. Among the materials used are: castor oil; alkyl aryl sulfonates; higher alcohols, such as capryl; aluminum stearate; sulfonated vegetable oils; pine oil; silicones; tributyl phosphate, and various proprietary products. The material used in largest amount is an alkyl aryl sulfonate which is added routinely to salt-water muds containing starch. The amount of foam breakers used in 1957 is estimated at 300 tons.

Foam formation . . . A recent development in the technique of air drilling is the deliberate formation of foam as a means of removing water and cuttings from the hole.[56] Penetration of a water-bearing formation while drilling with air results in wetting of cuttings and increase in pressure required to clean the hole. Introduction of the foaming agent into the air stream stabilizes pressure because the cuttings and water are removed as a foam.

Oil-Base Drilling Fluids

Oil-base drilling fluids are used where water in the mud interferes with analysis of cores, or with completion or production, and in drilling some shale sections. Most oil-base drilling fluids are made by blending prepared concentrates with fuel oils, selected crude oils, or mixtures of crude and refined oils.

Asphalt provides the sealing properties in most compositions. Asphalt may be added as air-blown asphalt[57] or may be a constituent of the oil used in the mixture.

Suspending properties usually are furnished by soaps formed within the mixture. Alkalies used are caustic soda, sodium silicate, and lime. The organic acids may come from vegetable oils,[58] tall oil,[59] commercial naphthenic acid,[60] rosin products,[61] or other sources. Some compositions contain small amounts of saturated solutions of calcium chloride or sodium chloride.

Water content is normally from 2 to 5%. Some compositions, however, by further chemical treatment can form stable emulsions of as much as 60% by volume of water in oil.[62] A stable emulsion of water or water-base mud in oil-base drilling fluids affords most of the favorable features of an oil-base fluid without some of the objectionable properties.[63 64]

Typical emulsifying agents are made in place by the reaction of lime or calcium chloride with lecithin, oxidized fats, tall oil, or rosin soaps. Nonionic surfactants are included in some compositions. Because most oil-base drilling fluids are sold as concentrates of undisclosed composition no reliable estimate can be made of the quantities of the various ingredients that are used. In California some oil-base drilling fluids are rented and a charge is made for reconditioning and handling. In other areas they are stored and reused by the oil operator. Total expenditures in 1957 for oil-base drilling fluids are estimated at $900,000.

Future Applications for Chemicals

Both oil producers and contractors are concerned over the continued rise in drilling costs. Expensive equipment and high wages fix operating cost; hence, more feet of hole per day is the only way to reduce cost of the well. As a result, research on the mechanics of drilling gives much attention to the influence of the circulating fluid on rate of penetration.

Earlier, emphasis was on keeping hole open. That problem has generally been solved. Now, emphasis is on making new hole faster. There is a search for chemicals to make hard rocks easier to drill, to clear cuttings faster from the formation face, to prevent dispersion of drilled particles, and to effect complete separation of these particles at the surface.

Air will be more widely used as the drilling fluid as soon as there is a rapid and certain method of shutting off water-bearing formations. Injecting liquid plastics has shown promise. Additives may be developed for injection into the air stream to seal water seeps.

As more is learned about how mud is lost to the formation, there should be improvements in the products and processes for stopping the loss. It's already known that control of density and gelation of the mud are important in preventing loss. New compositions may be devised that continuously seal potential fissures. If we can reduce the possibility of loss of the drilling fluid, we could economically use and reuse materials of high initial cost.

We now use centrifugal separators

to remove drilled solids and to recover barite from heavy muds. We could take advantage of this method to use essentially synthetic drilling fluids, possibly with heavy liquids as the continuous phase. These could be used repeatedly if solids are removed and the drilling fluid is reconstituted each circulation.

The importance of hydraulics to drilling has already caused modification of the requirements for flow properties of drilling fluids. Further changes in composition will be made to get better efficiency of power. New drilling tools may make important drilling-fluid properties that are now ignored, such as the abrasive qualities.

Already, bottom-hole temperatures above 450° F. have been reported. At greater depths temperatures will be higher so that more stable agents will be needed to control viscosity, gelation, and filtration if present muds are to be used. Or, as an alternative, we may devise new liquid compositions which have a minimum amount of dense suspended solids. Such a fluid should be thermally stable and heavy enough to control high pressures.

This article was adapted for The Oil and Gas Journal from a paper presented at an American Chemical Society meeting.

FROM 1952 TO 1956, the amount of weighting material used annually increased by 100%. Annual expenditure for lost-circulation material is close to 15 million dollars. Drilling mud consumes a large share of the nation's annual chemical output.

Literature Cited

1. Stroud, B. K., Oil Weekly, 37, 29 (June 5, 1925).
2. Adams, Ernestine, Petr. Engr., 30, B22, (March, 1958).
3. API, Dallas, "Mapping of Areas of High Pressure in the Texas and Louisiana Gulf Coast," API Bul. D5 (June 1954).
4. API, Dallas, "Recommended Practices for Standard Field Procedure for Testing Drilling Fluids," API RP 29, 4th Ed., 18 (May 1957).
5. Bugbee, J. M., API Drilling and Prodn. Practice 1953, 14 (1953).
6. Loomis, A. G., Ford, T. F., and Fidiam, F. J., Trans. AIME 142, 86 (1941).
7. Garrison, A. D., and ten Brink, K. C., Trans. AIME 136, 175 (1940).
8. Melrose, J. C., and Lilienthal, W. B., Trans. AIME 192, 159 (1951).
9. Rogers W. F., "Composition and Properties of Oil Well Drilling Fluids," 2nd. Ed., Gulf Publishing Co., Houston, (1953) p. 315.
10. Barnes, W. E., (to Sun Oil Co.,) U. S. Patent 2491436 (Dec. 13, 1949).
11. Hurdle, J. M., The Oil and Gas Journal, 55, 93 (Oct. 28, 1957).
12. Wayne, T. B., U. S. Patent 2294877 (Sept. 1, 1942).
13. Garrison, A. D., (to The Texas Co.) U. S. Patent 2361760 (Oct. 31, 1944).
14. Robinson, W. W., (to The Texas Co.) U. S. Patent 2369407 (Feb. 13, 1945).
15. Gray, G. R., Foster, J. L. and Chapman, T. S., Trans. AIME 146, 117 (1942).
16. Larsen, D. H., (to National Lead Co.) U. S. Patent 2417307 (March 11, 1947).
17. Kaveler, H. H., API Drilling and Prodn. Practice, 1946, 43 (1946).
18. Wagner, C. R., (to Phillips Pet. Co.) U. S. Patent 2425768 (August 19, 1947).
19. Wheless, N. H., and Howe, J. L., Drilling 14, 70 (August 1953).
20. Kennedy, H. T., and Teplitz, A. J., (to Gulf Oil Co.) U. S. Patent 2337296 (Dec. 21, 1943).
21. Bailey, L. H., Owen, W. L. Jr., and Owen, W. L., U. S. Patent 2360327 (Oct. 17, 1944).
22. Salathiel, R. A., Trans. AIME 195, 85 (1952).
23. Salathiel, R. A., (to Standard Oil Dev. Co.) U. S. Patent 2681312 (June 15, 1954).
24. Fordyce, R. G., and Baer, M., (to Monsanto Chemical Co.) U. S. Patent 2650905 (Sept. 1, 1953).
25. Fischer, P. W., and Cook, J. F., (to Union Oil Co. of Calif.) U. S. Patent 2552775 (May 15, 1951).
26. Oldham, W. N., and Kropa, E. L., (to Union Oil Co. of Calif.) U. S. Patent 2718497 (Sept. 20, 1955).
27. Cannon, G. E., The Oil and Gas Journal, 46, 101 (May 3, 1947).
28. Lancaster, E. H., and Mitchell, M. E. Jr., Trans. AIME 179, 357 (1949).
29. Goins, W. C. Jr., The Oil and Gas Journal 48, 52 (Jan 19, 1950); See also ref. (9) pp. 437-461.
30. University of Texas Petroleum Extension Service, Austin, Tex., "Principles of Drilling Mud Control," 10th Ed., pp. 14-16, 40-43 (1955).
31. Weiss, W. J., and Hall, W. L., (to The Texas Co.) U. S. Patent 2802783 (August 13, 1957).
32. Gray, G. R., Neznayko, M., and Gilkeson, P. W., API Drilling and Prodn. Practice 1952, 73 (1952).
33. Cross, R., and Cross, M. F., (to Kansas City Test. Lab.) U. S. Patent 2073413 (March 9, 1937).
34. Garrison, A. D., (to The Texas Co.) U. S. Patent 2239647 (April 22, 1941).
35. Vietti, W. V., and Garrison, A. D., (to The Texas Co.) U. S. Patent 2146693 (Feb. 7, 1939).
36. Vietti, W. V., and Garrison, A. D., U. S. Patent 2165823 (July 11, 1939).
37. Vietti, W. V., and Garrison, A. D., (to The Texas Co.) U. S. Patent 2165824 (July 11, 1939).
38. Cannon, G. E., (to Standard Oil Dev. Co.) U. S. Patent 2109808 (March 1, 1938).
39. Darley, H. C. H., (to Shell Dev. Co.) U. S., Patent 2744869 (May 8, 1956); Trans. AIME 267, 252 (1956).
40. Burdyn, R. F., and Wiener, L. D., The Oil and Gas Journal, 54, 104 (Sept. 10, 1956); World Oil 145, 101 (November 1957).
41. Keen, R. E., Petr. Engr., 29 B21 (Oct. 1957).
42. Chaney, P. E., API Drilling and Prodn. Practice 1942, 36 (1942).
43. Huebotter, E. E., Emerson, B. W., and Scearce, F. A., The Oil and Gas Journal 53, 109 (Dec. 13, 1954).
44. Hoeppel, R. W., (to National Lead Co.) U. S. Patent 2393165 (Jan. 15, 1945).
45. Buffington, E. C., and Horner, V. V., World Oil 131, 204 (July 1950).
46. Perkins, H. W., API Drilling and Prodn. Practice, 1951, 349 (1951).
47. Lummus, J. L., Barrett, H. M., and Allen, Harry, API Drilling and Prodn. Practice 1953, 135. (1953).
48. Browning, W. C., J. Petr. Tech. 9, (June 1955).
49. McGhee, Ed, The Oil and Gas Journal 54, 110 (Aug 13, 1956).
50. Mallory, H. E., Petr. Engr. 29, B21 (April 1957).
51. Weichert, J. P., and Van Dyke, O. W., Petr. Engr. 22, B16 (Nov. 1950).
52. Townsend, A. A., The Oil and Gas Journal 51 268 (Sept. 29, 1952).
53. Petroleum Week, 22, (Feb. 21, 1958).
54. Mallory, H. E., Drilling Contr. 56 (April 1957).
55. Gallus, J. P., Lummus, J. L., and Fox, J. E. Jr., SPE of AIME, Paper 875-G (Oct. 1957).
56. Murray, A. S., and MacKay, S. P., The Oil and Gas Journal 55, 105 (June 10, 1957).
57. Miller, G., U. S., Patent 2316968 (April 20, 1943).
58. Mazee, W. M., (to Shell Dev. Co.) U. S. Patent 2297660 (Sept. 29, 1942).
59. Dawson, R. D., and Blankenhorn, C. F., (to Shell Dev. Co.) U. S. Patent 2350154 (May 30, 1944).
60. Miller, G., U. S. Patent 2475713 (July 12, 1949).
61. Fischer, P. W., (to Union Oil Co., of Calif.) U. S. Patent 2542020 (Feb. 20, 1951).
62. Lummus, J. L., and Randall, B. V., World Oil 143, 150 (Nov. 1956).
63. Lummus, J. L., The Oil and Gas Journal 53, 106 (Dec. 13, 1954).
64. Nelson, M. D., Crittendon, B. C., and Trimble, G. A., API Drilling and Prodn. Practice 1955, 235 (1955).

Here's the outlook for automation in gas-transmission systems

This oil man declares:

A. L. VAUGHAN

Automation design is an accepted fact by my company's engineers. We have used it; we have found it successful; and we have made big plans for its uses on all machinery to be added to our system in the future. We have found it feasible both from an economic and an operational standpoint. Automation is nothing more nor less than an extension of the great industrial revolution that began in the latter half of the nineteenth century, and which, I might add, has created thousands of jobs where none existed before.

BY A. L. VAUGHAN
Manager, Plants Department,
Northern Natural Gas Co.

MACHINES will never be able to outthink men, but in many production situations machines are superior to men. For example, the watchful electronic eye of a mechanical monitor is never dimmed by a hangover, and its "brain" is never fogged by emotional stresses and strains.

Automation is 5 years old at Northern. My company turned to automation as naturally as a housewife turns to a bargain sale. Faced with continuing rising costs, we had the alternatives of increasing the price of our product or finding some way of possibly reducing, and for certain, better stabilizing the cost of our product. Automation appears to be an important part of the answer.

Today, we have five stations on our transmission system that are push-button-controlled—that is, fully automatic. We have 10 other stations wherein newly installed engines are automatically controlled, and when we plan, design, and construct new compressor stations they also will be fully automatic.

You might say my company took a calculated risk when it introduced automation to our system in 1953. At that time, engineering studies had indicated it was necessary that we add over 34,000 additional compressor horsepower on our system at two new locations in Kansas to meet growth demands. We took two steps of an experimental nature.

Early gas turbines . . . We decided to install gas-fired, turbine-driven, centrifugal compressor units at the two new station locations and at the same time make them subject to full automatic control. At that time, the gas turbine was still an unproven product not yet fully accepted by the industry.

However, our engineers were reasonably sure that the basic design of the gas turbine was sound and that maintenance costs and operating costs would compare favorably with the types of reciprocating equipment available. Cost figures for the operation of the stations since that time have justified our decision.

Presented before California Natural Gasoline Association, Pasadena.

The gas turbines were installed with full-automatic controls, which allowed the starting of each machine with one switch. This fully automatic function included starting, maintaining normal turbine speed, emergency control, and shutdown.

Reciprocating units automated . . . Our success with the initial gas-turbine installations led to further automation of our system. In 1954, we designed and placed into operation the first completely automatic control system on a large reciprocating-type compressor unit. It performed so well that we made several additional installations of this type later.

The automatic control system on our reciprocating compressor-engine equipment will perform the following sequence when switched to the "on" position:

- Start (1) the prelubrication oil pump which shuts off automatically when the engine-driven oil pump builds up sufficient pressure, (2) the air-filter screen, and (3) the aerial water cooler in electric-motor-driven installations.
- Open a small valve to pressurize the gas compressor and piping, also, open the gas-discharge valve and reclose the pressurizing valve.
- Set the engine governor control to idle speed.
- Turn on air to the engine which purges the power cylinders and exhaust piping, also, turn on the ignition and then open the fuel valve.
- Fire engine and accelerate to idle speed.

Idle speed is maintained until the operating temperatures of the engine reach a satisfactory level. At this point, the suction valve on lead line to the compressor opens and the bypass valve closes, putting the engine on load. The governor speed control is then released and the engine accelerates to whatever speed had been set on the speed control before its starting.

Purging air from the gas compressor before pressurizing the system may also be included in the automatic sequence. On the first few compressor engines we installed on our system, this purging was done automatically by allowing gas to flow through the pressurizing valve into the piping assembly and then out the blowdown valve during a timed purging period.

During this purge the bypass valve would be closed while the gas cleaned undesirable components from the compressor and then would reopen automatically near the end of the purge period to be in position for starting the engine. When the engine was shut down, the blowdown valve would then automatically open and

blow down the compressor piping assembly.

However, we have of late eliminated this purging and blowdown process from the automatic sequence, because we found that most of the engine shutdowns were of short duration not requiring purging and blowdown of the compressor before a restart. Elimination of these features is purely optional and may be retained when circumstances of the operation make it desirable.

Engine protection . . . During the operation performance the compressor engine is protected by a system of alarms which warn of low lubricating-oil pressure, high lubricating-oil temperature, low jacket-water pressure, high jacket-water temperature, high discharge-gas pressure, low control-air pressure, and high exhaust temperature.

If the condition which trips the alarm is not immediately remedied, automatic shutdown will then take place.

For normal shutdown, the starting switch is merely turned to the "off" position. This move returns the machine and all of its components to the proper position for a new start. Even the gas-line suction, discharge, and bypass valves are activated to return to the normal shutdown position.

The compressor blowdown valve will remain in closed position and keep the compressor pressurized until opened by manual operation of the blowdown control switch at the control panel.

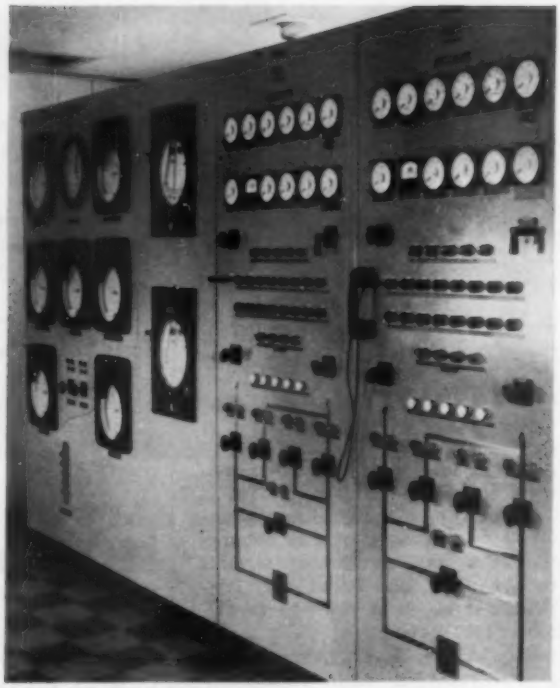
This function can be made automatic, but we feel that gas will be wasted unnecessarily in many instances.

When the engine is shut down by one of the emergency devices, all equipment thereon is returned to the normal starting position except the shutdown signal and light, which must be manually restored to the normal starting position by correcting the trouble which occasioned the shutdown and pushing a reset button.

Interlocks may be used on various devices to prevent starting of the equipment unless all valves and other components are in the proper position.

Control equipment on each engine is designed to allow the operator to start and operate the machine manually should a failure or malfunction in a component of the control system prevent automatic operation. Installations which use purchased electrical power have been designed with a 12-volt battery circuit in the control system to prevent the engines from automatically shutting down during momentary power interruptions.

Part of the protective functions of the control system are inoperative during power outages, the standby power generator, however, can be put into operation during these periods and retains all of the automatic control features.



REMOTE - CONTROL PANELS for two reciprocating compressor units are located near Palmyra, Neb.

Future program . . . We now have enough experience to know that automation is reliable and successful. Any compressor engines added at our existing main-line stations or newly constructed main-line stations will have automatic-control equipment installed.

Northern Natural is also at work on the use of automation in other phases of our over-all operation besides main-line compressor stations.

We are installing a compressor station adjacent to our Redfield underground gas storage area southwest of Des Moines, Iowa. Controls for these engines are being installed in a separate building in a nonhazardous area. Also in this control building will be valve controls, flowmeters, pressure indicators, temperature indicators, and other instrumentation for the operator to control the solid-dessicant dehydration plants used in connection with this storage field.

This same control building will accommodate equipment to operate the individual injection and withdrawal gas wells in the storage field over microwave circuits. Completion of this planned installation will give one operator located in the control building complete control of the storage-field injection, withdrawal, dehydration, and compressor facilities.

We have several field-gathering units installed which operate unattended with several shutdown devices such as low gas-suction pressure, low gas-discharge pressure, high gas-discharge pressure as well as the conventional engine-mounted protective devices.

If an engine shuts down for any failure it is now necessary to send someone to the remote location to restart the unit. We plan to connect these locations into a microwave control network in the future and control the units from the nearest manned compressor station.

My company is aware that recent installations have been made and are now in operation which remotely control complete stations from another station location or from the company's dispatching headquarters. Installations of this type are one more step in the eventual complete automation of a gas-transmission system controlled from one central location.

In my opinion the first completely automatic gas-transmission system controlled from a central location will be installed by a completely new transmission system or at least by one of the most recently constructed transmission systems with up-to-date modern-designed equipment.

Most of the older transmission systems have many outmoded horizontal-type machines which have so many points that would have to be monitored for a completely unattended plant that the investment would be prohibitive. When economic studies

FOUR gas-turbine compressor units use these remote-control panels near Tescott, Kans.

show that this outmoded equipment should be retired and new equipment installed, complete automation should be considered.

Another factor which makes conversion of the horizontal-type compressor engines unfeasible is the number of engines installed in a station with low horsepower ratings. The number of engines rather than the horsepower rating of each governs the cost of necessary automatic equipment for control. For example, a 20,000-hp. compressor station consisting of 10 engines of 2,000 hp. each would require almost double the investment in automatic equipment over a similar station consisting of five engines of 4,000 hp. each.

The method of growth of the gas-transmission companies over the years has usually been small yearly horsepower additions to each station as authorized by the FPC. Only recently has the trend to large-horsepower engines become more practical on main-line systems. As this trend continues the cost of automation per installed horsepower will decrease.

Simplification, standardization . . . One of the areas where great progress can be made toward automation is in working and cooperating with the engine manufacturer to simplify the equipment and eliminate as many of the controls and check points as possible without sacrificing, of course, necessary protection.

Whenever equipment is to be operated completely unattended it must be recognized that there are many possibilities for failure which would not normally be protected against by control devices on equipment at an attended station. Many of these points will need to be monitored on an unattended station or a calculated risk taken.

Automatic controls provide continuous monitoring of the points where they are installed. It must be remembered, however, that they cannot provide the diversity of protection on the complete station installation which is provided by a trained operator.

Standardization of equipment is another area in which progress can be made toward reducing the cost of automation and simplifying maintenance of the equipment and education of the personnel. This will be a most difficult problem as each engine manufacturer has his own method of building equipment and each gas-transmission company has its own ideas about how automation should be used.

Closer cooperation between all of these companies, users and manufacturers, will indeed help to correct this situation; however, complete standardization will undoubtedly remain a goal rather than an accomplished program.

The components of automatic controls can be electrical, pneumatic, or hydraulic. In the systems we now have in operation, we have found the best results are obtained by using a combination of all three systems using each in its most advantageous application. Improvements are being made in the design of the control systems when experience indicates a change should be made.

The type of system to use or the proportion of the system which should be electrical, pneumatic, or hydraulic will depend on the circumstances prevailing at the location of the installation. These varying conditions are one of the greatest obstacles to obtaining the goal of standardization of control systems.

Personnel . . . Automation in my company has been and will continue to be geared to maintain the jobs of the existing trained employes on the transmission system. New station installations are manned and will continue to be manned by transferring trained operating personnel from existing station locations.

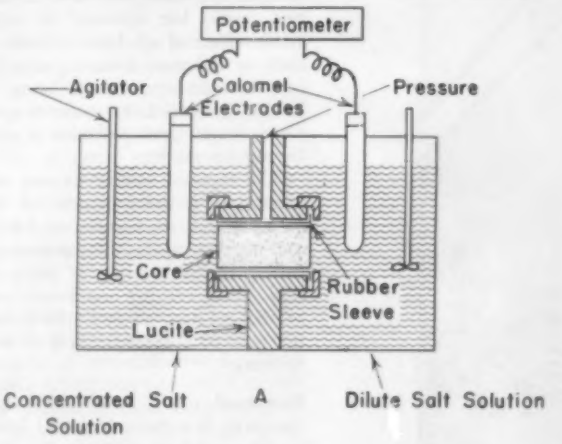
These installations require operators with much more technical know-how than is required to operate and maintain conventional-type installations. Knowledge and responsibility required to fill these positions increase while the manual labor required of the operator decreases. Manpower, the most valuable asset of any company, is thus more efficiently and effectively used.

Increased emphasis must be placed on proper education and training of personnel for them to function most effectively on the job. The increased complexity of automatic equipment makes it imperative that education of personnel be accelerated to keep pace with the advancement in equipment.

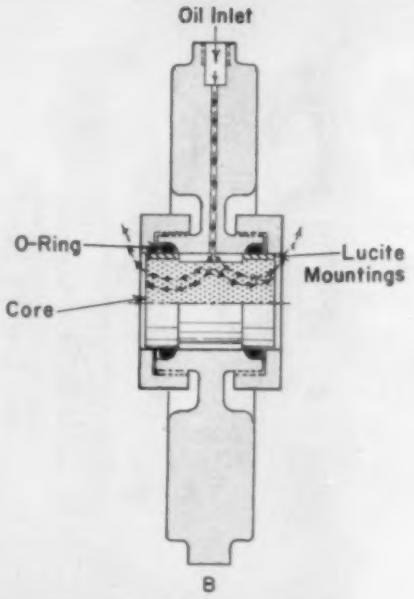
This education in most instances will be "on-the-job training." By making instruction manuals, schematic diagrams, literature, etc., available to the operating personnel, by encouraging them to use the material, and by giving them informal or formal assistance and instruction, as required, much can be accomplished to improve the efficiency of personnel.

Automation in the future is limited only by the imagination of the engineers and designers, and the investment which can be economically justified. The speed with which the automation program will move forward will depend greatly on the calculated risks which management is willing to take and the growth rate of the gas-transmission industry.

There is much research and development still to be done in the automation of the gas industry. I am sure that my company along with the many others will continue to contribute toward furthering its progress.



THE APPARATUS above measured the potential across partially saturated cores in which paraffin was the hydrocarbon phase. The core holder on the right was used when the kerosine-water system was studied. The hydrocarbon saturation was adjusted while flowing fluids through the core. Fig. 1.



Core Holder for Measuring Potential During Flow of Oil

When oil or gas is present . . .

Watch those log readings!

Sands appear more shaly on the potential curve with oil or gas present. High hydrocarbon saturations and low water salinities make readings even lower.

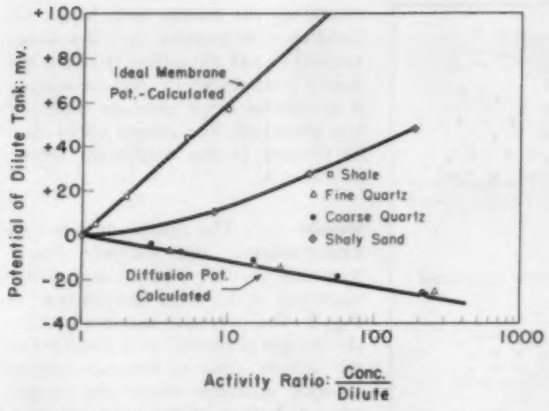
BY J. K. KERVER AND C. L. PROKOP
Humble Oil & Refining Co.,
Houston

RECENT laboratory work has shown that the presence of hydrocarbons in a porous formation may alter the magnitude of the SP reading to the point that some quantitative interpretations may be affected.

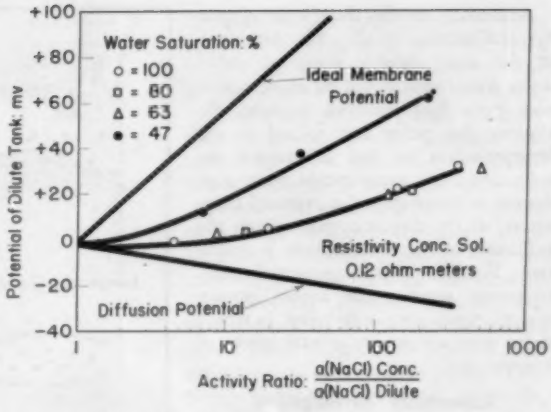
Background . . . The potential curve of the electric log has been widely used for a number of years as the basis for interpretation of strata. Only recently have the factors responsible for the origin of the potential been recognized. The Schlumberger brothers[1] pointed out that the potentials measured opposite sands and shales are different and that the difference is of diagnostic value. But it remained for Mounce and Rust[2] to give a logical explanation of the phenomenon. They demonstrated that the potential is electrochemical in nature, and that

The authors conclude . . .

1. The presence of hydrocarbons in a sand results, under particular conditions, in an alteration of the logging potential measured opposite the sand. The direction of the alteration is such that the sand appears to be more shaly.
2. The effect on potential of the presence of hydrocarbons is most pronounced at high hydrocarbon saturations, at low salinities of interstitial water, and in sands having small pore channels.
3. Although the effect may be appreciable in some cases, and even severe enough occasionally to obscure productive sands on the potential curve, it is likely that in most cases the effect is not large enough to be significant in the lithologic interpretation of the potential curve.
4. The existence of an effect due to the presence of hydrocarbons, even though generally not significant in lithologic interpretation, suggests that caution should be used in quantitative interpretation of the potential curve for such purposes as the estimation of the salinity of interstitial water.



POTENTIAL developed across porous media completely saturated with brine. Fig. 2.



POTENTIAL developed across a shaly sandstone core containing brine and oil. Fig. 4.

it depends on a salinity difference between connate water and the fluid filling the borehole.

They also showed that the seat of the potential is in shale. The electrical potential difference gives rise to the flow of current. Doll[3,4] has discussed the nature of these currents and the manner in which they affect the SP as it is measured in the well bore. In reference to an oil saturation, concern was given to a geometrical effect in the measurement of potential as contrasted with the actual origin of the potential.

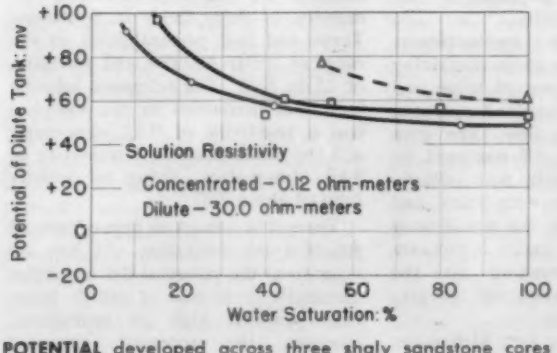
In 1949, Wyllie[5,6] explained the origin of the potential in terms of membrane theory. Shale, like certain membranes, permits passage of positively charged ions but not the negatively charged ones. This results in a potential across a shale between solutions of different salinities. Using this theory, Wyllie was able to give quantitative expression to the potentials observed opposite clean sands and "pure" shales. In 1952, McCardell, Winsauer, and Williams[7] presented an explanation of the origin of the potential. This permitted a prediction of the factors which affect the magnitude of the potential.

In most of the early work, it was assumed that oil or gas in a porous rock did not affect the magnitude of the potential. On the basis of field experience, however, Hamner[8] many years ago expressed the view that the potential in a water zone is often higher (i.e., farther removed from the shale base line) than the potential observed in an overlying productive zone. In recent years, McKelvey, et al[9]., Hill and Milburn[10], and deWitte[11,12] suggested that the reduction in the amount of water in a sand due to the presence of hydrocarbons tends to reduce the value of potential and to give an apparent increase in the "shaliness" of the hydrocarbon-bearing rock.

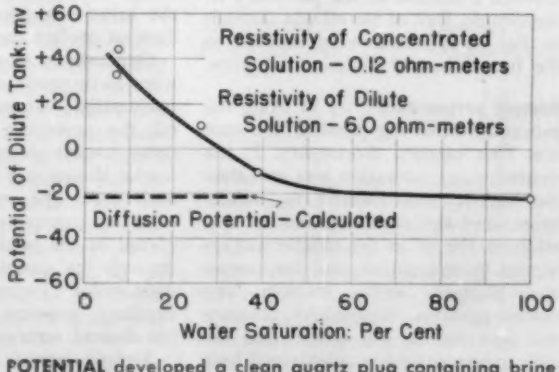
Direct measurements of the effect of oil saturation upon the potentials observed across actual core specimens of dirty sands have not been reported. This presents a limitation in both qualitative and quantitative interpretation of the electric log, as it is important to know the effect of hydrocarbons in a sand on the potential opposite the sand. If shaly oil or gas sands give the appearance of being more shaly, there is a possibility that potentially productive zones may be overlooked on examination of the potential curve. Likewise, even when a zone is known to be productive, an apparent increase in shaliness could make obscure the thickness of the zone and the amount of productive interval.

An investigation was started to evaluate this effect and to determine the import it might have in the interpretation of the electric log.

Plan of attack . . . In this investigation reliance was placed principally on experiments conducted in the laboratory. Field evidence, unfortunately, is usually subject to various interpretations. In planning the study, experiments were designed which would show the existence and magnitude of potential effects due to the presence of hydrocarbons. These consisted of measurement of the potentials developed across samples of several types of porous matrix materials containing various saturations of brine and hydrocarbons when the samples were interposed between brines of different salinities. Experiments were planned using both shaly reservoir sands and synthetic shale-free porous quartz materials.



POTENTIAL developed across three shaly sandstone cores containing brine and oil. Fig. 3.



POTENTIAL developed a clean quartz plug containing brine and oil. Fig. 5.

According to the theory developed by McCardell, et al[7]., the influence of the ionic double layer at solid-water interfaces would be more dominant with hydrocarbons present. To explore this point and to aid in the interpretation of the laboratory results, auxiliary experiments were conducted to investigate the order of magnitude of the distances over which the influence of the double layer is operative. For this purpose, potential measurements were made across porous quartz, containing only brine, in which there were extremely minute pores of known size.

Laboratory Investigation

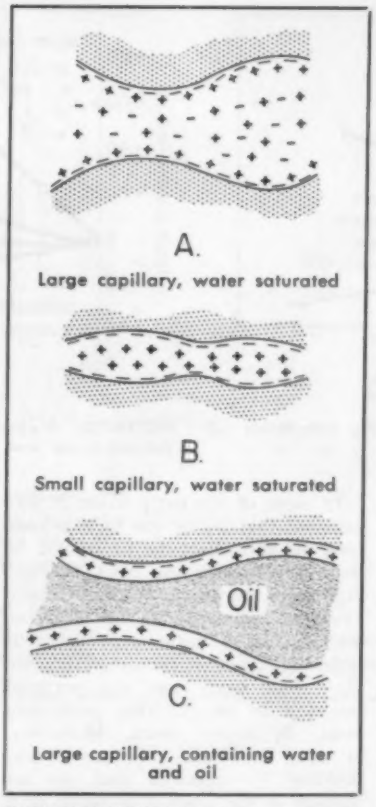
Potential measurements made on porous materials containing brine and hydrocarbons . . . The porous matrix materials used in the laboratory investigation consisted of cores of shaly sands from oil reservoirs, and high-permeability, artificial cores.

The fluids were pure NaCl solutions and kerosine or paraffin which was introduced into the porous material in the molten state and then allowed to solidify.

Apparatus . . . Two different techniques were used to measure the potential developed across a core containing both brine and hydrocarbon. In one, the paraffin saturation in the core was first adjusted to a desired value, then the sample was placed in a Hassler-type holder separating two tanks which contained brines of different salinities. The potential across the core was measured by means of a potentiometer, used in conjunction with calomel electrodes immersed in the two salt solutions. Fig. 1A. The measurements were made at 77° F.

In the other technique, the saturation of the kerosine was adjusted and maintained by flow during the potential measurement. The special core holder used in this technique is shown in Fig. 1B. This equipment permitted control of oil saturation by adjustment of the pressure causing flow through a portion of the periphery of the sample. Exit of the oil was through its flat faces which were exposed to the two brines of different salinities.

Sample preparation . . . In using the procedure involving paraffin, the core was first cleaned thoroughly. If the desired water saturation was low, then the matrix was allowed to imbibe brine until the desired saturation was attained, the air in the sample was removed by evacuation, and the sample was plunged under vacuum into molten paraffin. Atmospheric pressure was admitted to the system and the high temperature was maintained long enough for the paraffin to flow into the core and to approach capillary equilibrium. After the paraffin had cooled, it was cut away from the outside of the matrix.



ELECTRIC CHARGE distribution in capillaries. Fig. 6.

Higher water saturations were obtained by placing the sample containing water and paraffin in hot brine to expel a portion of the paraffin. After the desired higher water saturation had been reached, the sample was removed from the brine and placed in molten paraffin to approach capillary equilibrium. As a alternative procedure in the preparation of samples containing moderately low water saturations, the core was sometimes completely saturated with brine and the brine was then displaced by the flow of molten paraffin.

Generally, where measurements were to be made on cores containing intermediate saturations of brine and oil, the procedure involved potential measurement during flow. The core holder shown in Fig. 1B was used. In such cases the matrix was initially saturated completely with brine and placed in the holder. Oil was flowed through the sample under a pressure differential corresponding to the capillary pressure required to give the desired saturation.

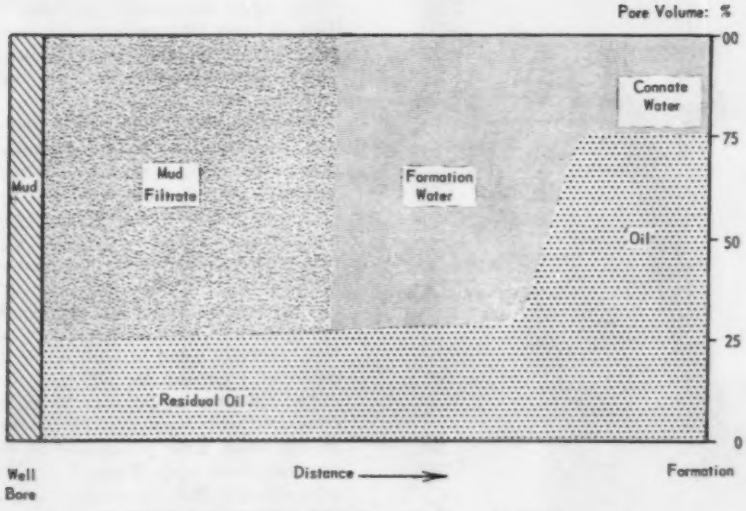
Samples containing very high water saturations were prepared by (1) saturating the matrix with brine, (2) flooding with kerosine to a low water saturation and (3) either flooding the matrix with brine or else permitting it to imbibe brine until no more oil was produced. The sample could then be utilized in the equipment shown in Fig. 1A.

Results . . . The results of potential measurements on various matrix materials which were completely saturated with brine are shown in Fig. 2. The potential measured across the sample is plotted as a function of the activity ratio of the two sodium chloride solutions which the sample separated. One of the solutions, generally the more concentrated, is, by convention, designated as the reference solution; the other is designated the "test" solution. The solution used to saturate the matrix was of the same concentration as the reference solution. The concentration was usually 1.0 molar, corresponding to a resistivity of 0.12 ohm-meter. The matrix materials utilized were quartz filter material of two different permeabilities, both of which were high compared to most producing sands, a compact shale from the Spraberry zone of West Texas, and a shaly sand from the Frio formation of Southwest Texas.

The potential developed across the porous quartz filter material was due to diffusion alone. That across the Spraberry shale approximated the theoretical potential for an "ideal" membrane [13 14]. Fig. 2 shows the data points along with the computed potentials for these two cases. The potential across the shaly sand, also on Fig. 2, was intermediate between that for the porous quartz and for the Spraberry shale.

In Fig. 3 are shown the results of potential measurements made on shaly sands containing both brine and hydrocarbons. In this figure the potential is plotted as a function of the water saturation. The three shaly sand samples utilized were from productive zones of the Frio and Vicksburg formations of three fields in Southwest Texas and had permeabilities in the range of 100 to 400 md. and porosities of 25 to 30%. The reference solution (and that contained in the samples) had a resistivity of 0.12 ohm-meter and the dilute solution a resistivity of 30.0 ohm-meters, giving an activity ratio of about 250.

There was a marked dependence of potential on saturation. At low oil saturations the potential did not differ materially from that at 100% water saturation. At high oil saturations, however, the potential increased significantly, so that, from the stand-



EXPECTED FLUID DISTRIBUTION in vicinity of well bore. Fig. 7.

point of their potential behavior, all the samples gave the appearance of becoming more shaly as their oil saturations increased. Thus, for example, the potential measured across one sample increased from 48 mv. at 100% water saturation to almost 80 mv. at 15% water saturation.

Fig. 4 shows the potential developed across a shaly sand containing various saturations of brine and hydrocarbons at different concentrations of the test solution. In this figure potential is plotted as a function of the activity ratio of the reference and test solutions. The reference solution had a resistivity of 0.12 ohm-meter. The shaly sand sample was from the Frio formation of southwest Texas and had permeability and porosity similar to those of the samples of Fig. 3.

As shown in Fig. 4, the potentials measured at water saturations of 100, 80, and 63% fell, as nearly as could be determined, on a single curve of potential versus activity ratio. Measurements made on the sample when it contained 47% water and 53% oil, however, yielded results which were quite different. At this lower water saturation the potential was significantly higher for a given activity ratio. As in the case of the samples of Fig. 3, the effect of a high oil saturation was to make the shaly sand appear to be more shaly.

Fig. 5 shows that the effect of the presence of hydrocarbons on potential is not restricted to shaly sands. The potential measured across a quartz filter plug containing brine and oil is plotted as a function of the water saturation. The matrix had a permeability of about 1,900 md. and a porosity of 41%. The reference solution had a resistivity of 0.12 ohm-meter, and the test solution a resistivity of 6.0 ohm-meters, giving an activity ratio of about 50.

At 100% water saturation the potential observed was very close to the calculated diffusion potential. At low values of water saturation, however, the potential had increased by about 57 mv. at 7% water saturation. It is evident from these data that even a very clean quartz matrix may, at very high hydrocarbon saturations, appear to be shaly in its potential behavior.

Discussion of results . . . It is apparent from the foregoing results that the presence of hydrocarbons leads to an apparent accentuation of the "shaliness" of a shaly sand and that, even in a clean quartz material, shalelike potentials may be developed at low water saturations. A reasonable explanation of this may be obtained from the theory presented by McCardell, et al.[7]

Siliceous surfaces in contact with aqueous solutions normally are negatively charged with respect to the solution. If the siliceous surface is that of a capillary passage of fairly large diameter containing water or brine, the distribution of charges is roughly as shown schematically in Fig. 6A. Negative ions are adsorbed on the solid surface, and the positive ions are distributed nearby in the aqueous phase. The thickness of the double layer between the negative ion adsorbed on the solid surface and the diffuse positive ions is, in this case, small compared with the pore radius, so that in the central portion of the pore there is little effect of the double layer on the movement of either positive or negative ions.

If the capillary is small, however, as is that illustrated in Fig. 6B, the thickness of the double layer may be appreciable compared with the pore radius, and the free movement of most of the negative ions may be restricted. It is this restriction of ionic mobility that gives rise to the potential observed across a shale interposed between solutions of different salinities.

When both water and oil are present in a large capillary composed of a water-wet siliceous material, the oil may fill a large part of the central portion of the capillary—that portion through which, if the capillary contained only water, both positive and negative ions could move freely. This case is illustrated in Fig. 6C. Now the same hindrance to ionic movement applies as in the case of the small capillary containing only water, since in both, the aqueous phase is dominated by the influence of the double layer. Though a double layer may exist at the oil-water interface, the charge density at this interface is probably small, consequently its effect is small compared with that of the effect of the double layer existing at the solid-water interface.

Both sands and shales possess surfaces that are negatively charged with respect to brines contained in their pores. In view of the experimental results obtained in the laboratory on both shaly sands and clean quartz, the type of mechanism illustrated in Fig. 6C may be called upon to explain both the accentuation of the potential of shaly sands by the presence of hydrocarbons and the development of a shalelike potential in a clean quartz matrix when it contains a high oil saturation.

Quantitatively, the thickness of the double layer adjacent to a siliceous surface is usually considered to be of the order of magnitude of millimicrons (mμ). Glasstone and Taylor[15] give the following estimates of this thickness (the distance from the solid surface at which the zeta potential falls to 1/e of its value at the surface) as a function of the ionic strength of the solution:

Ionic Strength, Moles per Liter	Double Layer Thickness, mμ
1.0	0.3
0.1	1.0
0.01	3.0
0.001	9.6

The average pore radius of the clean, quartz filter material used in this work was probably several thousand millimicrons and was certainly very much greater than any of the double layer thicknesses cited above. Consequently, when the material contained brine alone there should have been no observable effect due to the double layer. Kussakov and

Mekenitskaya[16] have shown that the thickness of a water film in a smooth, water-wet glass capillary, after the water initially filling the capillary has been displaced by oil, is of the order of 10 mμ. This thickness is comparable to the double-layer thickness in dilute solutions. If the thicknesses of the water layers in quartz cores containing high oil saturations approximated Kussakov and Mekenitskaya's value, then it is evident that the double layer could easily influence the potential across the sample and give rise to a shalelike potential.

Experimental tests were conducted on several nonshaly microporous materials having pore radii as small as 2 mμ., and the results substantiate the foregoing discussion.

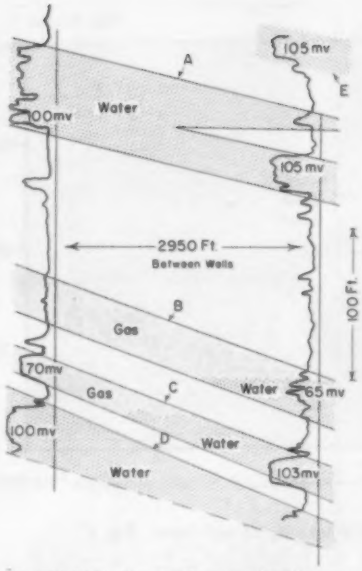
Application to Log Interpretation

The results of the laboratory investigation show that under appropriate conditions the presence of oil in either a clean or a shaly sand may alter the potential measured opposite it, and that the direction of this alteration is such that the sand appears to be more shaly. Even though no laboratory work was performed to investigate whether comparable results are obtained when gas and brine fill the matrix, it is likely that the effect on the potential of the presence of gas is similar to that exerted by the presence of oil.

The question arises as to whether the effect of the presence of hydrocarbons on potential is of importance in the interpretation of the electric log. This question may best be answered by noting the conditions necessary for the presence of hydrocarbons to be a factor. One condition which is necessary is a high hydrocarbon saturation. The effect is more noticeable when the interstitial water is of moderately low salinity. The laboratory experience indicates further that the smaller the pore size the greater is the effect.

Undoubtedly, the conditions favorable for the presence of an effect due to hydrocarbons are found in many reservoirs. Generally, however, it is likely that the effect is small enough to be neglected in a majority of cases. It is probable that the effect is diminished, too, by invasion of a hydrocarbon-bearing sand by mud filtrate, since where there is appreciable invasion there is accordingly a low hydrocarbon saturation.

During invasion, as described by Campbell and Martin[17] the mud filtrate displaces the connate water, and the connate water in turn displaces the oil. The resulting fluid distribution in the vicinity of the well bore is shown in Fig. 7. The interface



SP CURVES illustrating probable suppression of potential by the presence of gas. Fig. 8.

or front between the mud filtrate and the formation water thus occurs in a region of low oil saturation (residual oil). It is across this particular interface that the effect of an oil saturation upon ionic mobilities causes alterations in, or reversals of, the normal diffusion potential; and consequently, the oil saturation at the location of this interface determines the major influence of oil on the SP curve.

It is recognized, of course, that many conditions could occur which would alter the distribution of fluids presented by Campbell and Martin. For example, capillary, diffusional, gravitational, or other forces could cause the mud filtrate—connate water interface to reside in a region of higher hydrocarbon saturation than residual and could, in fact, be near that of the uninvaded zone. Although the exact location of this interface is not known, numerous logs have demonstrated by the magnitude of the potential reduction that the interface occasionally resides in a region of high hydrocarbon saturation.

An example of an effect on potential caused by the presence of hydrocarbons is shown in Fig. 8. In this figure are shown the potential curves of electric logs of two wells completed in the Yegua formation of the Gulf Coast area. The wells are approximately 3,000 ft. apart and occupy different positions on structure, so that some of the sand members which produce gas in the upstructure well are productive of water only in the downstructure wells. The resistivities of the muds used in drilling the two wells were essentially the same so that, all other factors being the same, potentials measured opposite the sands should have been the same in both logs.

In sand A, which contained water in both wells, the potential developed opposite the sand was approximately 100 mv. in each case. In sand B a very low potential was measured in the gas zone of the upstructure well, in comparison to a maximum potential of 65 mv. recorded for the water-bearing portion of the member in the downstructure well. In sand C, which was relatively clean in both wells, the potential recorded for the gas zone of the upstructure well was 70 mv. as compared with a potential of 103 mv. in the water zone penetrated by the downstructure well. These data indicate strongly that the reduced potentials observed in the gas sands were attributable to the presence of the gas.

Obviously, in the interpretation of electric logs it is not possible at this stage to make quantitative estimates of the effect of the presence of hydrocarbons on potential. Qualitatively, however, the implication is clear that in extreme cases the presence of hydrocarbons may make difficult meaningful interpretation of the potential curve, and may even in some cases obscure the presence of producing sands.

References

1. Schlumberger, C., Schlumberger, M., and Leonardon, E. G., Trans. AIME, 50, 237, 274 (1934).
2. Mounce, W. D., and Rust, W. M., Jr., Trans. AIME, 155, 47 (1944).
3. Doll, H. G., Trans, AIME, 179, 146 (1949).
4. Doll, H. G., Trans. AIME, 189, 205 (1950).
5. Wyllie, M. R. J., J. Petr. Tech., 1, 17 (1949); see also
6. Wyllie, M. R. J., and Patnode, H. W., J. Phys. and Colloid Chem., 54, 204 (1950).
7. McCardell, W. M., Winsauer, W. O., and Williams, M., Trans. AIME, 198, 41 (1953).
8. Hamner, E. J., Remarks made at Gulf Coast Section AIME meeting (1939).
9. McKelvey, J. G., Jr., Southwick, P. F., Spiegler, K. S., and Wyllie, M. R. J., Geophysics, 20, 913 (1955).
10. Hill, J. H., and Milburn, J. D., Trans. AIME, 207, 65 (1956).
11. deWitte, A. J., The Oil and Gas Journal, 55, No. 15, 115 (April 15, 1957); see also
12. deWitte, L., J. Petr. Tech., 7, 103 (July, 1955).
13. Donnan, F. G., Chemical Reviews, 1, 73 (1924).
14. Alexander, A. E., and Johnson, P., Colloid Science, Vol. II, 820, Oxford University Press, London (1949).
15. Glasstone, S., and Taylor, H. S., "Treatise on Physical Chemistry—II", D. van Nostrand, New York (1951).
16. Kussakov, M. M., and Mekenitskaya, L. I., USSR Academy of Sciences, Publishing House, Moscow (1955).
17. Campbell, W. M., and Martin, V. L., Trans. AIME, 204, 233 (1955).

Deep Hole in Assumption Parish. Here's a part of a Falcon Seaboard crew working on a deep-well job in Assumption Parish, Louisiana, just a few miles north of the Gulf. When the picture was taken, they were coming out of the hole, which had reached a depth of more than 13,000 ft. Plans called for setting a string of 7⅝-in. casing, then drilling to a final depth of about three miles.

The rig was equipped with a Bethlehem rotary line, a 1¼-in. rope with tremendous reserve. It had the great strength and toughness that are always needed to handle drill pipe and casing. Bethlehem also furnished the coring line, which was shielded from moisture and gases by a heavy bethanized coating.

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Cost of operating vacuum flash units

BY W. L. NELSON
Technical Editor and Petroleum Consultant

THE COST ELEMENTS involved in vacuum flashing (see table) can all be estimated with ease except the steam consumption and the water required to condense the steam. This complicated subject has been discussed in Process Costimating Nos. 31 and 33 (Process Steam, Nov. 10 and Dec. 1, 1958) and No. 34 (Jet Steam, Dec. 8, 1958). Process steam is dependent primarily on the amount vaporized, whereas jet steam is related mainly to the operating pressure (and water temperature), and they are both related to the boiling range of the feed material. There is therefore no adequate way to estimate steam consumption except by a detailed study. Nor is the scant literature of much help because it shows process steam of 2.5 to 34 lb. per barrel, jet steam of 19 to 35 lb. (only three operations), and costs (1956) of 5.5 to 11.6 cents per barrel.

The amount of process steam can be stated in terms of boiling range, percentage vaporized and pressure as indicated in the chart of Process Costimating No. 33, but jet steam is so vitally dependent on water temperature that it must be estimated for each particular plant situation (see Process Costimating No. 34). Properly designed equipment can operate at pressure drops between the vaporizer and the flash plate of only 4 to 9 mm. (at lowest pressures).

Process Costimating No. 39 (Jan. 29, 1959) will discuss vacuum distillation, that is, systems in which several products (lubes) are produced.

References

1. Peavy et al., Various Refinery Applications of Houdriflow . . ., Ref. Nat. Gaso. Mfr., June 1949.
2. Esso Petroleum Engineering Course (Bayway plant).
3. Kraft, W. W., Vacuum Distillation of Petroleum Residues, Ind. Eng. Chem., May 1948, p. 807.
4. Allinder, F. S., Handling Reduced Crude, Pet. Refiner, Nov. 1955, p. 197.
5. Filak et al., What's Needed to Estimate . . . Vaporization, The Oil and Gas Journal, July 11, 1955, p. 141.
6. Primrose, J., Atmospheric and Vacuum Distillation, The Oil and Gas Journal, Mar. 12, 1931, p. 70.
7. Peters, W. A., (best discussion in literature), Science of Petroleum, Vol. II, p. 1599-1618, Oxford Univ. Press, N. Y., 1938.

TABLE 1—ELEMENTS OF OPERATING COSTS (VACUUM FLASHING OF STRAIGHTRUN FEEDS)

Element—	Unit (somewhat standard)	1956 unit cost	For 10,000 B/D plant (cts./bbl.)	See Process Costimating No.
Labor:				
Supervision	0.5 men/8-hr. shift*	$3.85/hr.†	0.14-0.83*	26, 28, 41**
Operating	2.5 men/8-hr. shift*	$3.12/hr.†	0.62-3.4*	
Maintenance	3-4%/yr. of replacement	$57-97/daily bbl.	0.56-0.75	29
Fuel	55,000-77,000 B.t.u./bbl.‡	20-40 ct./M.M. B.t.u.	1.55-5.22	3, 4, 6, 30
Power	0.0042-0.0067 b.hp.-hr./bbl.	21.6 ct./day for 1 hp.‖	0.09-0.14‖	13, 14, 21-23, 36**
Cooling water:				
Products and jet steam	240-680 gal./bbl.	1.7 ct./M. gal.	0.41-1.15	15, 16, 38**
Main barometric	20-2,400 gal./bbl.	1.7 ct./M. gal.	0.03-4.08	
Steam:¶				
40% vaporized	8-18 lb./bbl. §(14)	45-60 ct./M. lb.	0.4 - 1.1	17, 18. 31, 33, 34, 37**
50% vaporized	8-39 lb./bbl. §(18)	45-60 ct./M. lb.	0.4 - 2.3	
70% vaporized	8-100 lb./bbl. §(38)	45-60 ct./M. lb.	0.4 - 6.0	
80% vaporized	8-185 lb./bbl. §(66)	45-60 ct./M. lb.	0.4 -11.1	
Total direct cost (probable extremes)	.....	.....	5.0 -19.0	
Obsolescence, insurance, taxes and interest (7% of replacement per year)	.....	.....	1.31	
Laboratory overhead	0.1-0.3 men/8-hr. shift	$3.12/hr.†	0.05	
Other indirect costs	.....	.....	1.36	

*Small independent refiners use about one-third as many men whereas major operators use about twice as many as shown here.

†Average U. S. wages including 27% for all burdens.

‡Heat absorbed, which must be divided by the thermal efficiency of the pipe-still heater.

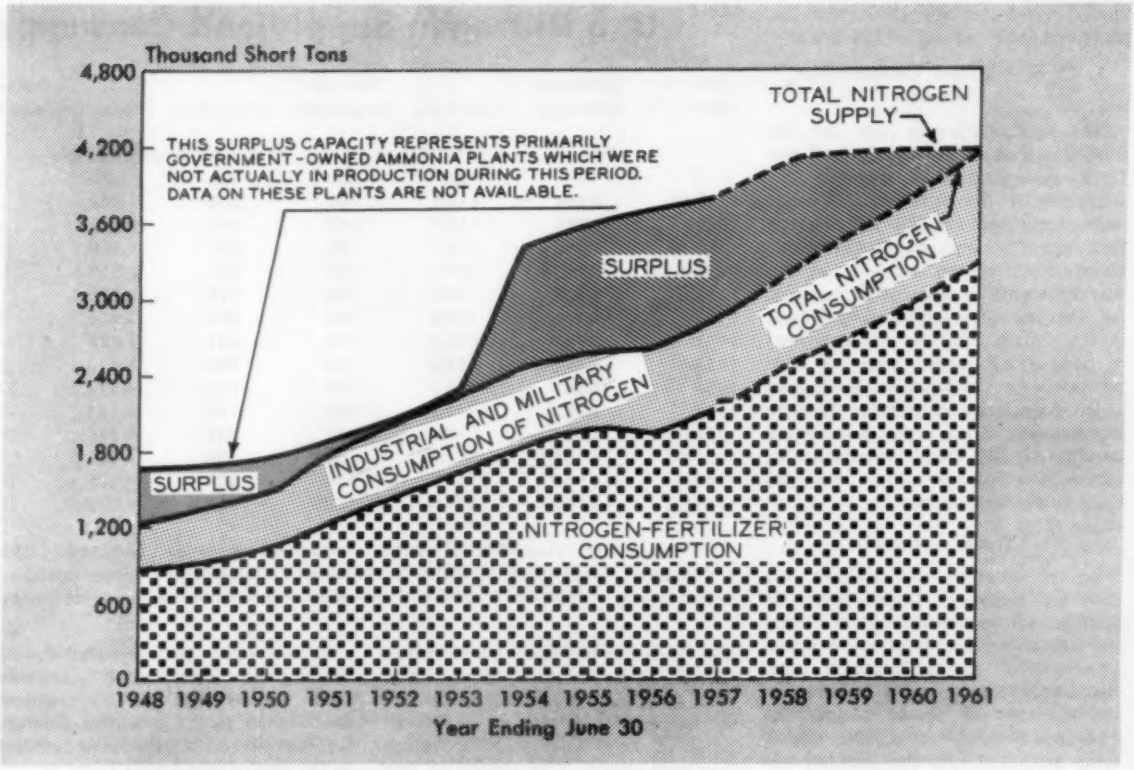
§Based on 75° F. water outlet temperature from barometric condensers. At the largest percentage vaporized the use of 65° F. outlet water reduces the steam consumption nearly 50%, whereas the use of 85° F. water requires over 50% extra steam. The ranges are caused mainly by boiling range (750° F. mid-boiling point and 900° F. mid-boiling point). About half process steam and half jet steam is often in the range of optimum operation (see Questions on Technology, The Oil and Gas Journal, May 14, 1956, p. 171). Included is 0.1-0.4 lb. steam per gallon for stripping of the bottom product. The numbers in parentheses are thought to be average steam consumption.

Note especially that the steam consumption of jets ranges from at least —40% to +160% which means that the consumptions shown here may range from —20% to +80% by the variation in jet steam alone.

¶Additional steam may be used to drive pumps (see Power item above).

‖For electricity at nine mills. Steam-driven pumps could increase the cost as much as tenfold.

**Will be published within 2 months.



UNITED STATES nitrogen supply and consumption patterns, years ending June 30, 1948-61. Fig. 1.

Ammonia supply and demand . . . *in balance by 1961?*

That's the prospect, according to a careful analysis of the U. S. nitrogen market. Here're the factors involved

BY JACK MELNICK
Senior Economics Consultant,
Boni, Watkins, Jason & Co., Inc.,
New York and Washington

A RECENTLY COMPLETED quantitative analysis of the United States nitrogen industry leads to the conclusion that the serious overcapacity which has plagued the industry for several years will disappear by 1961 . . . provided, of course, that there is no further increase in ammonia capacity beyond that now contemplated.

- **Since 1948,** total United States consumption of nitrogen has been increasing steadily at an average annual rate of almost 10%.
- **Consumption** should continue to increase at about the same rate, reaching a level of 4,176,000 tons by 1961.
- **More than three quarters** of the total consumption today is used in fertilizers and the remainder in a wide variety of industrial applications and for military purposes. It is estimated that these three primary sources of demand for nitrogen will, together, through 1961 at least, maintain and possibly exceed the recent annual rate of increase in total consumption.

The projection is based mainly on the forecast of fertilizer-nitrogen demand. The estimating equation, while embracing an established trend factor, includes also a factor not hitherto used for this purpose, though it is demonstrably in accord with historical facts and economic logic. Briefly, it is the relationship of the prices farmers pay for commercial fertilizer and the prices they pay for other cost elements.

- **Synthetic ammonia** capacity increased sharply during and since World War II, and by June 30, 1958, was capable of supplying 4,089,000 tons of nitrogen annually. The wave of plant expansion has passed its crest and only a few new plants are now being built.
- **Based on present** plant capacity and the new plants now being built, synthetic-ammonia capacity should reach 4,165,000 tons of nitrogen in 1961.

Assuming the validity of these projections of demand and of supply, and continuing peace, the nitrogen market will be in balance in 1961, as Fig. 1 shows. This chart shows the actual demand-supply relationship, an-

nually, 1948 through 1957, and the projected relationship, 1958-1961.

1. U. S. Nitrogen Consumption, 1958-61

The forecasts made here are the product of an intensive survey of the forces governing U. S. nitrogen consumption by the principal classes of consumers. Because data on nitrogen uses are few and military requirements hard to predict, little in the way of statistical demand is possible for the industrial and military categories. Much may be accomplished in quantifying future levels of consumption for fertilizer use.

In forecasting fertilizer nitrogen consumption, these approaches were considered: (1) trend approach, (2) factor-analysis approach, and (3) share-of-market approach.

Trend Approach

In an attempt to establish the probable range of future levels of fertilizer nitrogen consumption during the 4-year period, 1958-61, a basic-trend analysis was applied to the data. Because of the subjectivity inherent in the selection of trends, a searching examination of the conditions underlying market supply and demand was undertaken.

Continuing trend . . . Nitrogen fertilizer consumption will probably continue at its accelerated postwar rate, the study revealed. Hence, the curves selected to project its near-term rate of consumption were chosen on the basis of their ability to reflect this postwar trend. Through these successive steps in the analysis, the following projections were obtained:

Projected United States Nitrogen Fertilizer Consumption

(Unit: Thousand short tons)

	Year ending June 30—			
	1958	1959	1960	1961
Trend A	2,341	2,524	2,715	2,913
Trend B	2,566	2,855	3,177	3,535

These trends represent realistic limiting values of near-term future levels of consumption and as such provide a framework within which a more accurate pattern of consumer behavior in this market may be determined.

Factor Analysis Approach

The factor influencing most the farmer's purchase of fertilizer nitrogen has, historically, been his ability to pay for it, as measured by some index of farm income. Factors other than gross farm income, such as acreage under cultivation, total farm output, nitrogen content of the soil, and the cost price of commercial fertilizer are also related to fertilizer use. However, because data on gross farm income were so readily available and because its movements paralleled so closely those of fertilizer-nitrogen consumption, researchers have tended to base their forecasts almost exclusively upon that relationship.

Farm income . . . It's clear, however, that since 1948 at least, farm income has signally lost the influence it once exerted on farmers' purchases of fertilizer nitrogen. This change is shown in Fig. 2 which plots fertilizer nitrogen consumption against farm income in the previous year, annually, 1940 through 1957. In the pre-1949 period, fertilizer-nitrogen consumption moved upward directly, in fact in an almost perfect linear relationship, with gross farm income.

In 1949 and since, a steeply rising trend in fertilizer-nitrogen consumption set in, while farm income hovered around the 1948 level. Specifically it has varied only within a range of about 10% above and below the 1948 level, and in 1957 was almost exactly on that level. Yet in the same period fertilizer-nitrogen consumption has risen roughly 150%; in only a single year of this period did it decline, and then only slightly.

What other factors? . . . Only one other factor was found which explains the 1947-57 sharp upward movement in consumption. This is the relationship between the prices farmers pay for fertilizers and the prices they pay for other productive inputs—expressed as the ratio of the index of fertilizer prices to the index of all prices paid by farmers.

TABLE 2 U. S. Nitrogen Supply and Consumption

Year	Synthetic ammonia	Coke-oven	Natural organics	Imports	Total	Conversion and losses
					(1)+(2)+(3)+(4)	
	(1)	(2)	(3)	(4)	(5)	(6)
1948	1,389	†180	30	205	1,804	69
1949	1,389	197	30	217	1,833	69
1950	1,565	167	38	220	1,990	78
1951	1,593	195	40	225	2,053	80
1952	1,707	168	36	290	2,201	85
1953	1,756	180	36	429	2,401	88
1954	2,987	185	35	421	3,628	149
1955	3,292	183	30	373	3,878	165
1956	3,561	201	30	330	4,122	178
1957	3,782	178	30	294	4,284	189
1958‡	4,089	178	30	302	4,599	200
1959‡	4,165	178	30	302	4,675	200
1960‡	4,165	178	30	302	4,675	200
1961‡	4,165	178	30	302	4,675	200

*Conversion losses 5% of synthetic ammonia capacity. †Estimate. ‡Forecast.
Source: (1) 1948-1953: USDA, Statistics on Fertilizer and Liming Materials in the United States. 1954-1957: USDA, Commodity Stabilization Service, the Fertilizer Sit-

In the 9-year period under discussion, farmers have tended to increase their use of fertilizer to maintain productivity in the face of a decreasing labor force, a substantial increase in the cost of non-family labor as well as of other productive factors, and acreage restrictions, all of which put a premium on high yield per acre.

A farmer can afford to buy as much fertilizer as can be justified, economically, by an increase in yield that results in an addition to gross income in excess of the cost of the fertilizer applied to the soil. Many other factors may contribute to rising crop yields such as irrigation, better seed, better drainage, insect control, and mechanization. But after making allowance for variations in the weather, the use of fertilizer is probably the most important single factor responsible for increasing yields per acre.

It is readily seen from Table 1, which lists the comparative rates of change in the principal farm cost items, that fertilizer cost has risen slowly and least, while the over-all farm cost picture has increased rapidly and considerably.

These figures support the thesis that an important factor spurring the rising consumption of chemical fertilizer has been its relatively low cost.

Table 1—Farm Cost Rates, January 1955
(Indexes: 1955—1939 = 100)

Hired labor	431	Feed	213
Land	249	Machinery	205
Livestock	247	Farm supplies	197
Buildings	243	Seeds	190
Taxes	226	Motor supplies	156
Motor vehicles	224	Fertilizers	152

Source: USDA, "The Farm Cost Situation," May 1958, p. 4.

Ending June 30, 1948-61 (M. Short Tons)

Exports	Total supply	Consumption: Agricultural	Consumption: Industrial and military	Consumption: Total	Indicated surplus	Surplus as a per cent of supply
	(5)−[(6)+(7)]			(9)+(10)	(8)−(11)	(12)÷(8)
(7)	(8)	(9)	(10)	(11)	(12)	(13)
65	1,670	857	367	1,224	446	26.7
62	1,702	920	394	1,314	388	22.8
168	1,744	1,005	431	1,436	308	17.7
100	1,873	1,237	530	1,767	106	5.7
73	2,043	1,422	609	2,031	12	0.6
44	2,269	1,637	595	2,232	37	1.6
62	3,417	1,847	618	2,465	952	27.9
141	3,572	1,961	597	2,558	1,014	28.4
255	3,689	1,933	675	2,608	1,081	29.3
268	3,827	2,135	712	2,847	980	25.6
321	4,078	2,457	736	3,193	885	21.7
321	4,154	2,697	784	3,451	673	16.2
321	4,154	2,954	859	3,813	341	8.2
321	4,154	3,235	941	4,176	(22)	(0.5)

uation for 1956-1957, June 1957, Table 5, p. 7. (2), (3), (4) and (7) USDA, Commodity Stabilization Service, the Fertilizer Situation, 1948-1957. (9) USDA, Commodity Stabilization Service, the Fertilizer Situation, 1948-1957.

Not the whole story . . . Other influences, such as nonfarm fertilizer use, weather, soil bank, and the trend toward increased consumption of higher quality food have also affected the over-all level of nitrogen fertilizer consumption.

In addition, the rates of change in consumption have varied among regions of the country. The North Central area, for instance, has experienced an exceptionally large increase in the rate of fertilizer application.

Maintaining soil fertility . . . Soil scientists and agronomists have long been advocating greater use of fertilizers. Agricultural colleges, fertilizer associations, and associated institutions have sponsored programs to impress farmers with the urgency of expanding their use of fertilizers. This campaign has made notable progress toward its goal.

The foregoing factors all tend to affect the nitrogen consumption growth characteristics. Their aggregate impact might best be measured by including a trend factor in the forecasting equation. When both these determinants of nitrogen fertilizer consumption are statistically combined the following forecasting equation is obtained:

$$C = 421\ p^{-.4542335}\ 1.139^{t}\ .999^{x}$$

Where:

C = nitrogen fertilizer consumption in thousand short tons

p = ratio of fertilizer prices to the index of all prices paid by farmers

t = trend factor (time; 1941 = 1)

$x = t^2$ = trend factor squared (time squared; 1941 = 1)

The relationship between price and consumption is inverse, of course, as indicated by the negative sign in the exponent of that variable. That is, as price declines consumption increases, and vice versa. Second, the impact of trend is direct rather than inverse. Finally, the equation reflects the relatively greater impact of the nonprice factors upon the over-all level of fertilizer-nitrogen consumption.

On the basis of this equation and assuming no radical change in the surrounding circumstances, consumption of fertilizer nitrogen in the years 1958-61 may conservatively be projected to reach the following levels:

Estimated U. S. Nitrogen Fertilizer Consumption

Year ending June 30	Thousand short tons
1958	2,464
1959	2,710
1960	2,970
1961	3,256

It is seen in Fig. 3, these values lie in a range almost equidistant from the two relevant trends which were used in continuing the historical experience a short distance into the future. Since each of these sets of historically based values is equally likely, the most probable forecast is represented by the following arithmetic mean:

Forecast of U. S. Fertilizer Nitrogen Consumption

(Arithmetic mean of estimated and projected values)

Year ending June 30	Thousand short tons
1958	2,457
1959	2,697
1960	2,954
1961	3,235
Annual compound rates of growth	Per cent
1957/1948	10.67
1961/1957	10.99

"Share of Market" Approach

As a check on the reasonableness of these results, nitrogen-fertilizer consumption for 1958-61 was analyzed by evaluating its position vis-a-vis the projected total commercially supplied plant nutrient consumption, i.e., by determining the proportion of nitrogen to other ingredients in the projected commercial-fertilizer consumption. This manner of estimating the consumption of nitrogen used in commercial fertilizers may best be described as the "share of the market" approach.

Consistent trend . . . It may be remarked, incidentally, that this proportion traces a singularly consistent trend in recent years, rising from 27.3% in 1952 to 35.5% in 1957. This, the projection of nitrogen fertilizer consumption on this basis has much cogency.

Close agreement . . . As the following results show, the outcome of such a computation agrees very closely with that obtained by projection of nitrogen-fertilizer consumption directly on the basis of known variables, the most important of which are taken account of in the estimating equation above.

Estimated U. S. Fertilizer Nitrogen Consumption

("Share of the market" approach)

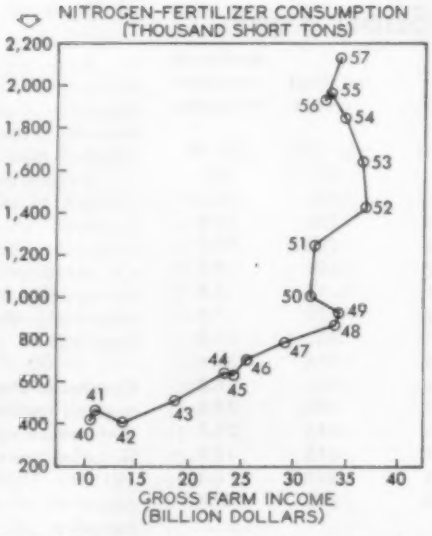
Year ending June 30	Thousand short tons
1958	2,505
1959	2,768
1960	3,034
1961	3,330

2. Estimating Industrial and Military Consumption

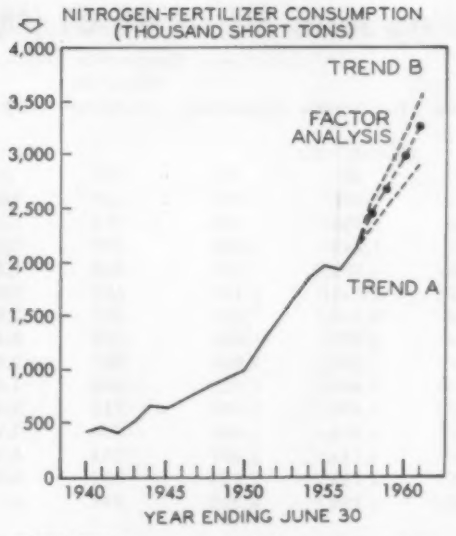
Because of its widespread and diverse uses, and the chemical manipulations and transformations involved in the production of its derivatives, the end-use pattern of industrial nitrogen is difficult to determine. Estimates of past experience are difficult to obtain; at best, guesstimates suffice in appraising future levels of consumption. At present, approximately 23% of total U. S. nitrogen consumption is devoted to industrial and military use. Considerable expansion in the industrial uses of nitrogen is anticipated for the future. **The total tonnage requirement of such uses is likely to be modest, however, in comparison with the potential for profitable employment of nitrogen as a plant nutrient,** and it is expected that a progressively greater portion of the output of synthetically fixed nitrogen will be consumed in agriculture.

Military nitrogen consumption . . . This cannot be meaningfully evaluated

until the U. S. international position becomes clearer. However, research projects devoted to the development of solid rocket propellants have progressed to a point providing indications of a possible increase in the use of nitrogen for military purposes. In view of the uncertainty attending certain of the industrial and military uses, and the lack of reliable data regarding all these uses, the only sensible basis for an appraisal of the future outlook for nitrogen consumption in these fields appears to be the assumption that, barring a hot war, existing uses will be expanded and new uses developed gradually. If a shooting war should occur during the forecast period, accordingly, the following estimates of U. S. industrial and military nitrogen consumption would have to be revised.



PLOT of fertilizer nitrogen consumption vs. farm income, 1940 through 1957, shows farm income is no longer prime factor influencing nitrogen fertilizer purchases. Fig. 2.



ESTIMATED U. S. nitrogen fertilizer consumption, 1958-61, as determined by factor analysis approach, compared with trends "A" and "B." Fig. 3.

U. S. Industrial and Military Nitrogen Consumption

Year ending June 30	Thousand short tons
1958	736
1959	784
1960	859
1961	941
Annual compound rates of growth	Per cent
1957/1948	7.64
1961/1957	7.22

The forecasts for fertilizer, industrial, and military nitrogen consumption for 1958-61 may now be added to obtain total nitrogen consumption.

U. S. Total Nitrogen Consumption

Year ending June 30	Thousand short tons
1958	3,193
1959	3,481
1960	3,813
1961	4,176
Amount compound rates of growth	Per cent
1957/1948	9.83
1961/1957	10.08

3. Projected U. S. Nitrogen Supply

The supply of nitrogen necessary to meet the above estimated future requirements will be available principally from the U. S. synthetic-nitrogen industry in the form of synthetic anhydrous ammonia. In accordance with a long-established pattern of supply, a small part will come from processes for the recovery of ammonia as a byproduct of coke production, and the remainder from traditional sources of natural organics.

Synthetic anhydrous ammonia . . . This accounts currently for 88.9% of total nitrogen supply. The really spectacular growth in synthetic ammonia capacity dates from the U. S. entry in World War II. Between 1942 and 1946, ten synthetic-ammonia works were built, tripling the prewar production capacity and raising the total annual capacity to 1,500,000 tons.

At the close of the war, the government-owned war plants were taken out of production and were gradually, over a period of years, transferred to private ownership and brought back into production. But with the outbreak of hostilities in Korea in 1950, the demand for ammonia again soared. The Government initiated another expansion program and a number of new plants were built.

Overcapacity . . . By the end of 1953, the wind had once more shifted. The new companies and new plants which had come in with a rush created excess productive capacity and made further investment in ammonia unattractive. A look at the situation at the start of 1957 indicates that there were 54 works, owned by 39 separate companies, producing synthetic ammonia. The combined capacity of these works was 4,089,000 tons annually, representing an increase of 194.4% in the last 10 years.

How much in '61? . . . A moderate amount of expansion is still going on, although this development is somewhat offset by the fact that the large Morgantown, W. Va., plant of Olin Mathieson is being taken out of production. Based on estimates of existing capacity and the planned capacity of plants already announced, the projected synthetic ammonia capacity in 1961 will reach 4,165,000 tons of nitrogen.

The following projections of U. S. nitrogen supply indicate that the supply from sources other than synthetic ammonia will not expand greatly, if at all.

Projected U. S. Nitrogen Supply
(Unit: Thousand Tons)

	1958	1959	1960	1961
Synthetic ammonia	4,089	4,165	4,165	4,165
Coke-oven ammonia	178	168	178	178
Organic nitrogen	30	30	30	30
Imports	302	302	302	302
Total supply	4,599	4,675	4,675	4,675

4. U. S. Demand/Supply Balance 1961

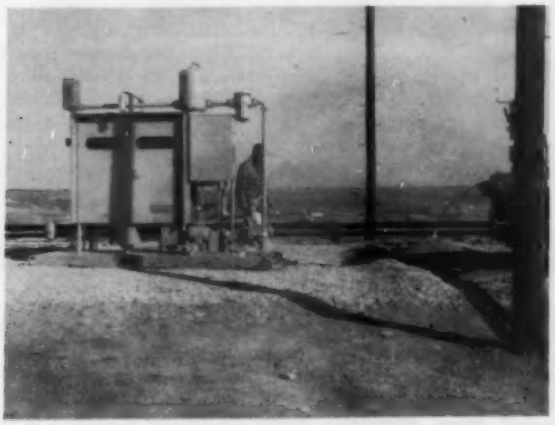
If there is no further increase in ammonia capacity beyond that now contemplated, if over-all demand increases at the rate determined in this analysis, then supply and demand will reach a balance about 1961. In certain regions this balance undoubtedly will be reached earlier than in others. Only one thing could radically change the picture: a tremendous and completely unpredictable increase in military or industrial consumption.

The statistics in Table 2 as charted in Fig. 1 reveal the difference between the demand for and the supply of nitrogen during the past 10 years and the projected period.

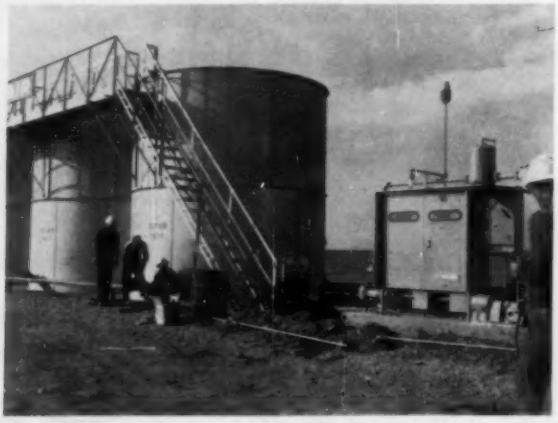
LACT unit installed on Tuesday, runs oil on Wednesday

6:50 a.m., Tuesday. LACT unit loaded and ready to be moved from Major Engineering Co.'s Tulsa factory.

9:30 a.m., Tuesday. Unit delivered to location in Fairfax Unit Waterflood and unloaded.



9:40 a.m., Tuesday. Metering unit in position on the lease and ready to be connected into the flow stream. No foundation is required as the unit includes an integral concrete base.



10:00 a.m., Tuesday. Installation work started. Note warning beacon on top of metering unit which was carried in its shipping bracket until unloading was completed. (Box at upper left corner of unit is previous photo). Installation of this light and removal of foam-rubber padding on instruments is all that is necessary to ready the unit.

4:30 p.m., Wednesday. Meter shows that 100 bbl. of oil has already gone through the unit. Clyde Osborn, Sinclair district engineer, Tulsa, is checking meter reading.

Package-type metering unit installed in jig time

THE SKID-MOUNTED meter-type LACT unit was unloaded at Tract "G," Fairfax Unit Waterflood, in Osage County, Oklahoma, at 9:30 a.m., November 11, 1958. By 4:30 the next afternoon, November 12, the meter showed that 100 bbl. of oil had been handled.

This "quickie" installation can be made because the unit, manufactured by Major Engineering Co., Tulsa, is complete and ready to go as it leaves the factory. Only a small amount of work is involved in hooking the unit into the flow stream.

Since startup, all the oil produced from this tract has been run through the unit. The 700-bbl. per day production was previously handled by four 500-bbl. tanks.

Total labor required to install the unit is as follows:

Two electricians with pickup truck	6 hours
Two roustabouts	11 hours
One welder	9 hours

The estimates for total cost of installing the unit, including materials and labor, run as low as $300, with the absolute maximum being well under $500.

The meter was proved on November 17, using a 14-bbl. proving tank designed by Sinclair engineers. Meter factors on two successive proving runs were within 0.0005 units of each other. These limits were acceptable to Sinclair and Mid-Continent Pipe Line personnel. Proving the meter required only 2½ hours.

Properties of stocks

should be considered when selecting materials

FOR petroleum products, standards for materials are usually set on the basis of volatility of the stocks handled. Centrifugal pumps, for example, should be made of steel if they are to handle oil lighter than 40° API gravity or 14 psi. R.V.P. and the operating pressure exceeds 150 psi. Also the use of cast-iron pipe should be limited to oils below 68° API gravity and to water below 450° F. and 200 psi. pressure.

Safety in Material Selection

Safety, is always a factor in materials selection. Often a more expensive material is used to insure safe operation particularly where failure would endanger personnel or result in loss of property from fires or explosions. Cast-iron valves and fittings, for example, are used on crude-oil lines in the tank farm while the same line inside of an operating unit would be constructed with steel valves and fittings.

Steel construction is required within operating-unit areas because the crude would very likely be set afire if a line should break at this location, but the chance that a leak in the tank field would be set afire is much less likely. The same pipeline would be provided with a steel block valve against the tank in the tank field to prevent failure of the valve in the event of a fire in or around the tank.

Material costs . . . The availability, first cost, fabrication and installation costs, and maintenance costs contribute to the total cost of an item of equipment. It may be found that the most expensive material is the cheapest when considered over the service life of the unit. On the other hand it sometimes is found that the lowest maintenance cost over a long period is obtained by replacing a very low-cost material frequently rather than to pay for an expensive alloy.

Other factors such as the complexity of rebuilding the equipment and whether or not the unit must be shut down to make the repairs, have to be considered in making the cost analysis. In special cases where dangerous chemicals are used and safety becomes an important factor then the cost is only of secondary importance.

THESE physical and chemical properties of the stocks handled by the equipment are of importance:

- Whether water, gas, oil, or chemical.
- Specific gravity or API gravity.
- Vapor pressure at operating temperature.
- Corrosive materials present in stock.

Corrosion . . . The corrosion of metals present some difficult problems. In addition to corrosion from acids and other chemicals used in refinery operation, corrosion is also caused by salts and sulfur found in the crude and from well water, river water, and steam condensate.

Sulfuric acid is handled at alkylation units, isobutylene extraction units, alcohol units, refinery and lube batch agitators, and acid plants.

In selecting materials for corrosive services care must be taken to review experience with materials in similar service and select those materials which have been most satisfactory. The equipment-inspection department should keep careful records on the progress of corrosion. It also should study critical locations by installing samples inside the operating equipment to learn what effect the corrosive materials have upon special metals and alloys that are available for linings, tubes, tower parts, etc.

The factors that influence the rate of corrosion of metals are:

1. The strength and type of the corrosive material.
2. Temperature in the corrosive area.
3. Velocity of materials at point of corrosion.
4. Oxygen content of corrosive material.
5. Battery type of galvanic corrosion.

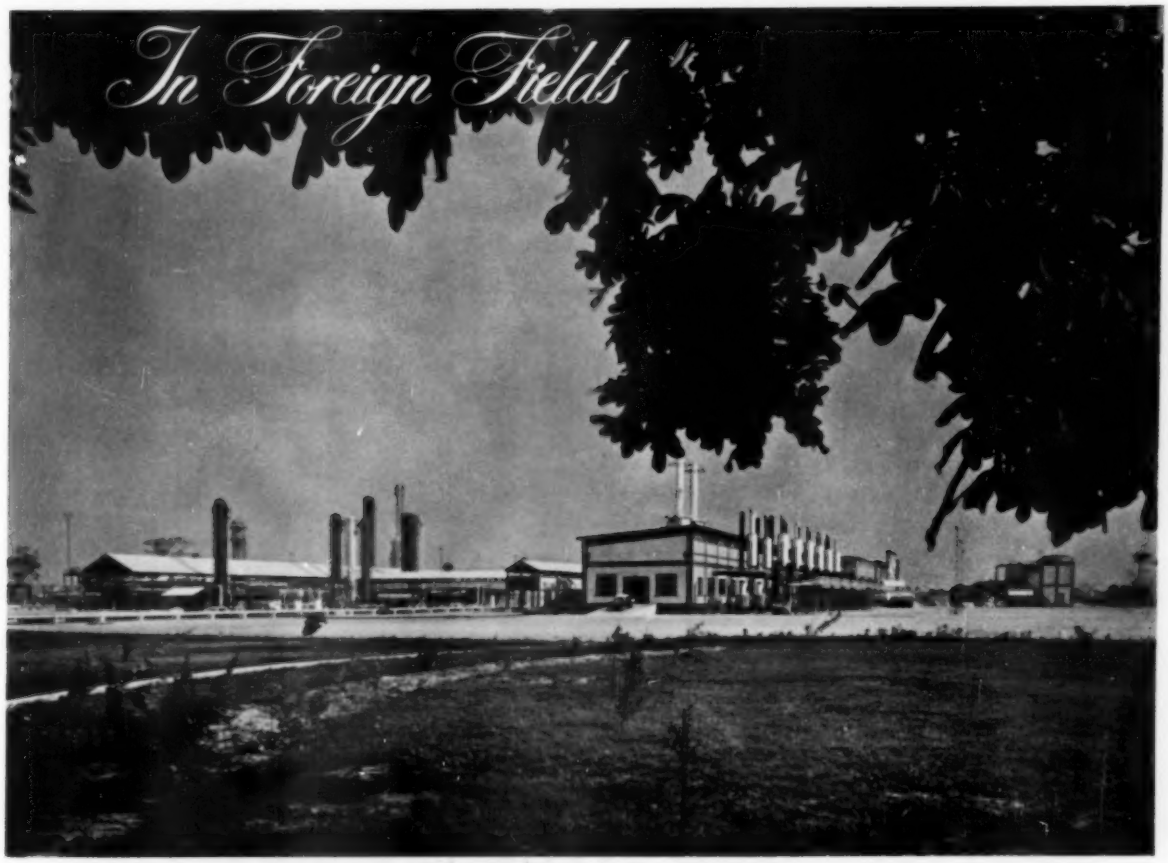
Sulfuric acid is a good example of a material that changes in corrosiveness at the strength of the acid changes. A weak sulfuric acid below 80% will not corrode lead but will attack steel while a strong acid of 80% or higher will not corrode steel but will attack lead.

In general, most corrosion rates are increased, as the temperature of the affected equipment is increased. There are exceptions to this, however, such as copper alloys at moderate temperatures which are found to be just exactly the reverse to this general rule.

An increase in velocity of acid, for example, over the surface of a material will greatly accelerate the rate of corrosion. This is due to the higher rate at which the corrosive chemicals, including oxidizing substances, are brought in contact with the surface of the corroding material and to the higher rate at which the protective coating of corrosion products is washed away. When the protective coating is washed away by high velocity of the liquid, fresh metal is exposed to additional corrosion.

Oxygen prevents corrosion of some metals and accelerates the corrosion of other metals. For example, a stainless steel of the 18-8 chromium-nickel type will resist weak acids when oxygen or air is present in the system to form a coating on the metal which resists corrosion. If this oxide film is not maintained the weak acid becomes very corrosive. On the other hand a different alloy like monel is only mildly corroded in oxygen-free weak acid but is corroded very rapidly when air is present with the weak acid. From these examples we can appreciate the corrosion problem that is created in a weak-acid system when air is present with the weak acid. From these examples we can appreciate the corrosion problem that is created in a weak-acid system when air is present only part of the time as would be the case in a vacuum system that develops a leak.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso Standard Oil Co.



PETROLEOS MEXICANOS

Gas Processing Plant

CIUDAD PEMEX, MEXICO

HUDSON services in foreign fields are flexible to the owners' requirements, including design and building of the entire project, or process design, mechanical design, purchasing or construction. Illustrative is the above pictured major gas processing project in Mexico, designed to extract 30,000 barrels of liquid products from 500 million cubic feet per day of gas. Process design, mechanical design, and procurement of equipment was entrusted to HUDSON. The plant was constructed by Petroleos Mexicanos near the Yucatan Peninsula in Mexico.

In Mexico, Canada, South America, Europe, and the Near East; in deserts, mountains, and jungles; in locales in some cases without established rail, road, or water transportation; working at times with inexperienced labor forces of mixed nationalities; under climatic extremes, HUDSON has completed major oil, gas, chemical, and heavy mineral processing projects – on time – and to the complete satisfaction of the owners.

This varied experience from Tierra del Fuego to Canada, from Pakistan to Peru, qualifies HUDSON to complete with speed and facility major processing projects under the most difficult conditions in any part of the world.

DESIGNERS AND CONSTRUCTORS OF PROCESS PLANTS FOR THE OIL, GAS, CHEMICAL, AND MINING INDUSTRIES

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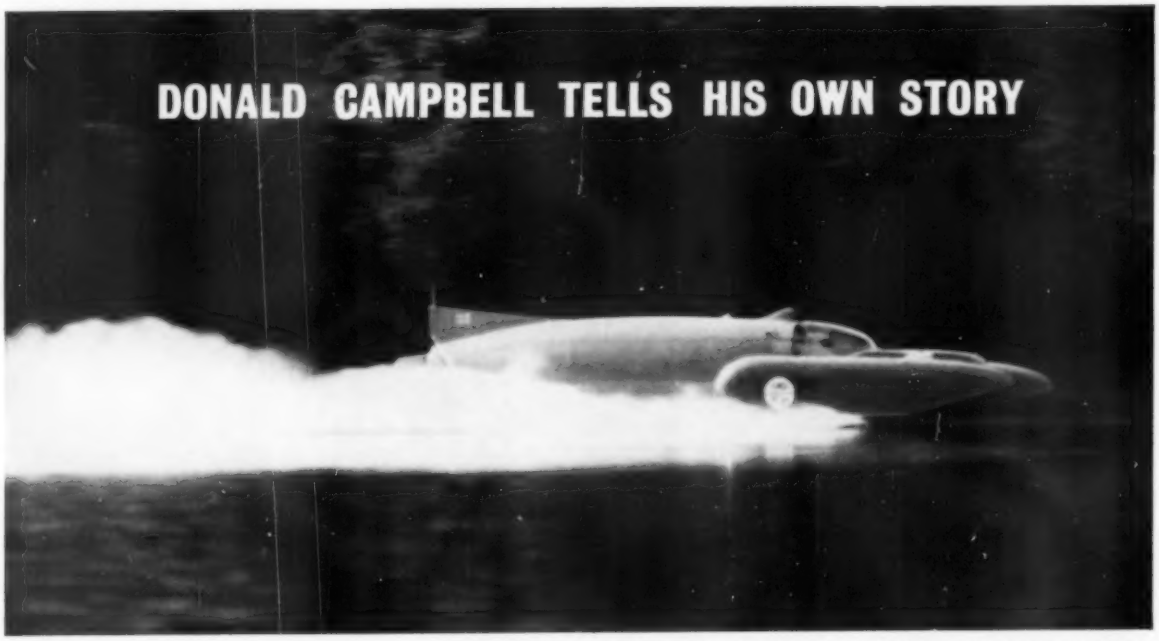


'THE SENSATION IS ONE OF SKATING - SILENTLY - AT TERRIFIC SPEED'

How I broke through the 'water barrier'–and lived by DONALD CAMPBELL

Who smashed the World Water Speed Record for the fifth time on November 10th at 248·62 m.p.h.

EVERYONE knows about the 'sound barrier'. That barrier of shock waves which jet aircraft hit at a little over 750 m.p.h., and which causes the familiar 'bang' in the sky. Not so much is heard about the 'water barrier'. And far less is known about it. What is this 'water barrier'?

HIGH-SPEED PITCHING

The water barrier is caused by factors quite different from those which cause the sound barrier. Mysterious factors that are still not entirely understood. But what *happens* is this.

Somewhere between 180–240 m.p.h. – the critical speed varies between different boats and might even be higher – violent and rapid pitching sets in. The boat is vibrated up and down many times a second. This puts a tremendous strain on its structure – and also subjects its pilot to severe gravitational loading. Which means that – every time the boat vibrates – his body's weight may momentarily increase seven times.

This is a moment of great danger. The tragic death of John Cobb was caused by the water barrier. Travelling at a speed of 206 m.p.h., his boat Crusader was vibrating 18 inches up and down 7 times a second. It blew to pieces.

200 M.P.H. IN 15 SECONDS

Bluebird was designed from the start to be strong enough to break through the barrier. 20 thousand man-hours of research work were put in before we even started to build her. A scale model with a rocket motor was exhaustively tested. The result? Bluebird is one of the strongest craft – boat or aircraft – ever built, taking into consideration her size and her weight. We estimate that she is capable of withstanding *twice* the stress to which she is subjected in record-breaking runs.

Another point about Bluebird. Her acceleration. Apart from one or perhaps two aircraft, *Bluebird accelerates faster than any other craft ever built. At 95% of full power, she will reach 200 m.p.h. in 15 seconds!*

FINGER LIGHT

How did it feel to hurtle across Coniston Water at record-breaking speed in Bluebird?

The sensation is always one of skating – silently – at terrific speed. That's on calm water. If the water is disturbed, it's like riding in a springless car with solid tyres over cobblestones.

There was plenty to do and think about. Take steering. Bluebird at speed is the most delicate thing a man could hope to handle, and like lightning in her response to the controls. The touch of a finger will alter her course. Then there are instruments to watch – and watch closely, because safety depends on them. Air speed indicator, water speed indicator, rev. counter, jet pipe temperature, stress meter, fuel pressure gauge. Radio contact to be kept. All this to be done with incredible rapidity. Because, remember, it takes only *50 seconds* from the start of a fast run to the moment I'm ready to step on shore again.

A NEW RECORD

Naturally I'm proud and happy to have managed to break the world water speed record for the fifth time. I meant to top 245 m.p.h. this time and I've done it. And I'm more than grateful to everyone who helped to make this possible. To Leo Villa, my chief engineer. To all the others who worked with me. **And to The British Petroleum Company, whose fuels and lubricants were used for Bluebird's successful run.**

Future plans? Bluebird can go even faster. With the experience we now have Leo and I are sure of it. In 1960 I'm planning to do 300 m.p.h. in her. Not only that. In the same year I want to have a crack at the land speed record. And raise that to 400 m.p.h. So here's to 1960!

The British Petroleum Company, whose fuels and lubricants were used in Bluebird, congratulates Donald Campbell on his record-breaking achievement.

BP

Do-it-yourself ideas cut upkeep

Here are 11 that Continental's mechanical department devised

BY LARRY RESEN
Refining Editor

SHORTCUT methods simplify mechanical-department jobs at Continental Oil Co.'s Lake Charles, La., refinery. These range from simple to complex, and are used to improve efficiency.

A special roller-bearing stand supports long shafts being worked in a lathe when they extend out beyond the lathe body (Fig. 1). Base of the stand is made up from a short length of heavy angle iron. Attached to the vertical section of the base are two ball bearings so spaced that a shaft resting between them can easily rotate. Top edge of the base between the two bearings was rounded down so there would be no interference with the shaft.

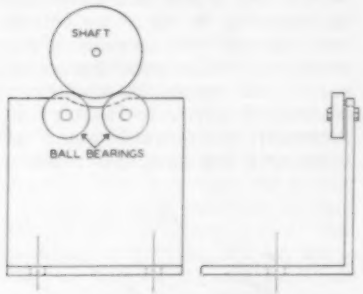


Fig. 1.

The stand is blocked up to evenly support the end of the shaft being worked. With it, much longer shafts can be handled by a small lathe for the stand supports the shaft at a level height and the bearings allow the shaft to have complete freedom of rotary motion. Closed-type ball bearings are used to avoid interference from dust and grime.

Dummy shaft . . . A very simple means is used to protect the ends of shafts when using a puller to remove bearings, couplings, and the like. A dummy shaft (Fig. 2) is inserted between the puller and the shaft. This consists of a very short rod, less than 2 in. The pointed end of the puller impinges against this dummy shaft and pressure is transmitted through it to the entire flat end surface of the shaft from which the bearing or whatever is being removed. Any damage which may be incurred due to the puller's being off center will be absorbed by the dummy shaft, which can be easily and cheaply replaced. The main shaft, meanwhile, remains undamaged, no matter how many times the puller is used.

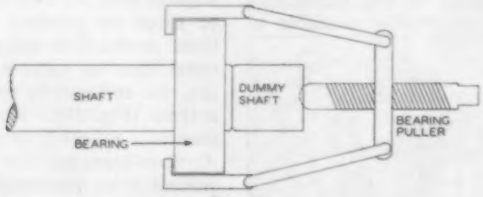


Fig. 2.

Milling attachment . . . In milling keyways in shafts and other round stock, a simple attachment can provide a steady support to the stock being worked. This consists of a V-block mounted sideways on the lathe (Fig. 3). An adapter can easily be made depending upon the particular lathe. The work can then be fed across the block as the cutter works the keyway.

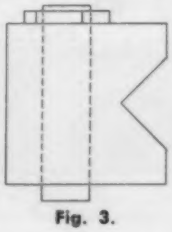


Fig. 3.

Another handy tool for use with lathes is a split-nipple for supporting split-type bearings (Fig. 4). The split nipple is fitted around the bearing with its halves diametrically opposed to the bearing halves to avoid slippage. The nipple bearing is then placed in the lathe chuck and secured so the necessary machining can take place. Pressure exerted by the chuck is absorbed by the nipple and any scoring which occurs takes place on the nipple rather than the soft-metal surface of the bearing. Short nipples can be made up with various diameters to accommodate the different size bearings in use.

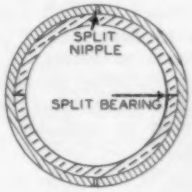


Fig. 4.

Jeweler's V-block . . . When working with instruments and small equipment a problem always exists in knocking out shaft pins when disassembling components. A jeweler's type block is used to eliminate such a problem (Fig. 5). The block was made by cutting a 1-in. thick section from an old 3-in.-diameter shaft.

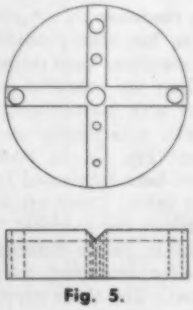


Fig. 5.

Two V-shaped grooves were cut at right angles across one face of the block. Several holes were then drilled through the block, centering in the grooves. Different sized holes were drilled to handle different sized pins.

When a pin now has to be removed from a shaft, the shaft is placed in one of the grooves, with the pin in position directly above one of the holes. A punch is then used to drive the pin out of the shaft. In this manner, the pin is easily removed since the shaft is supported from below by the block. This eliminates scoring which may occur had the shaft been held by a vise while the pin was driven from it.

Safety valves . . . A test rack has been made up for routine testing of safety valves. As is usual, these are tested at periodic intervals under pressure. In the past, it has been a trying job to determine if a valve had developed a small leak. If the leak were exceptionally small, it was difficult to detect by watching the gages. Escaping air makes noise, but in a busy shop, other noises make this method of detection less than desirable.

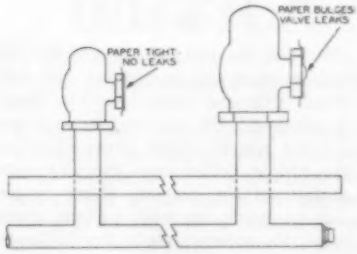


Fig. 6.

The solution: Wet paper towels! These are placed over the outlet of the valve (Fig. 6). Their being wet provides a perfect seal. Any air escaping from the valve immediately causes the paper towel to bulge, providing a definite indication of a faulty valve.

Welding machines . . . A compact arrangement has been provided for the welding machines used throughout the plant. These are mounted on portable platforms with built-in containers for spare rods, a tarpaulin, and fire extinguisher (Fig. 7). In addition, two reels have been fabricated for holding electrical cable. These are located on either end of the platform.

The cable passes through a fiber bearing—for insulating purposes—on to the reel. The shaft supporting the

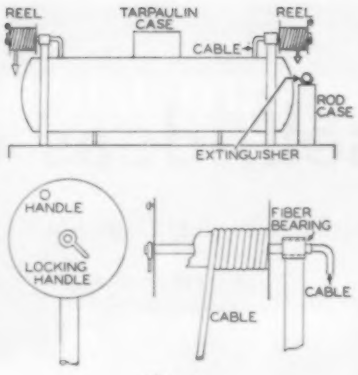


Fig. 7.

reel extends through the outer housing disk, and is threaded at this end. A locking handle, made by welding a short bar to a nut screwed on the shaft, is used to bind the reel in any position, simply by screwing in on the handle. With this method, only the needed length of cable is unreeled, which improves housekeeping around the unit being worked on. It also contributes to longer cable life since the cable is neatly wound on the reel, avoiding kinks and abuse. An automobile steering-wheel knob is secured to the outer housing on the reel to expedite winding the cable back on the reel.

Blind rack . . . During turnarounds, numerous blinds are needed to block off various lines on the unit. The blinds are placed in lines leading into towers, furnaces, exchangers, etc., as a guard against possible valve leakage or fumes which might endanger work being performed on the equipment. A wide variety of blinds are necessary.

To facilitate handling of these items, a blind rack has been constructed (Fig. 8). When a unit is shut down, this rack, carrying assorted sizes of blinds, is pulled to the turnaround site. Blinds are readily available to

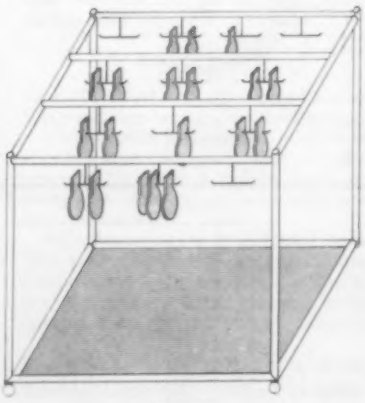


Fig. 8.

the maintenance crews this way. When the work has been completed, the blinds are pulled from the lines and replaced on the rack until needed again.

The rack is simply a box frame made from old piping, with several crosspieces welded across the top. Inverted T-shaped hangars are welded to the bottom of the crosspieces. The hangars were made from short pieces of steel reinforcing rod. Blinds are hung from these and are easily visible and readily accessible. The base of the rack is made of heavy wire mesh capable of supporting small tools and equipment. The rack is equipped with dollies so it may be easily moved about the plant.

Another turnaround item has been the use of reinforced wooden scaffolding to cut down on attrition due to splitting of board ends. Each end of the heavy boards has been drilled through and a bolt inserted through the hole (Fig. 9). Once the bolt has been secured, this provides a reinforced end. With extended usage, the boards will remain in condition to continue in service for a long time. Previously, many boards would split at the ends and have to be replaced.

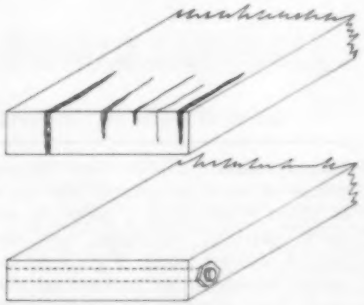
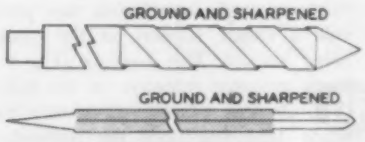


Fig. 9.

Tapered mill . . . Two handy tools can be made by grinding down existing tools. In the first instance, where the spiral ends of mills have been broken, the end can be ground down to a taper (Fig. 10). This can then be used as a tail stock center on a lathe. A three-cornered file can also be ground down for about 2 in. to provide a three-cornered cutting edge (Fig. 11). This can then be used as a scraper for removing burrs from bearings, round housings, and the like.



Figs. 10 and 11.

Interface detectors: progress but not perfection

BY R. R. HANCOX
Director of Research, Great Lakes Pipe Line Co.

FOR MORE THAN 5 YEARS the Great Lakes Pipe Line Co. has actively pursued an investigation into the problem of interface detection.

Since Great Lakes transports only refined petroleum products, we are concerned with the following types of interfaces: (1) fuel oil-fuel oil, (2) gasoline-fuel oil and (3) gasoline-gasoline. Large differences exist in several physical properties for the first two types of interfaces. We have found these relatively easy to detect by different methods and have, therefore, concentrated on detection of gasoline-gasoline interfaces.

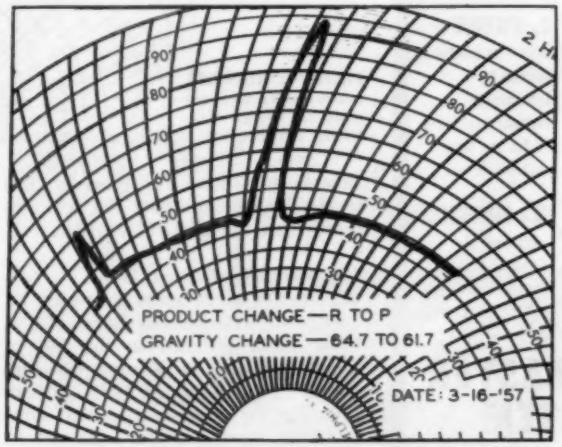
It seems improbable that it will ever be possible to detect 100% of the interfaces by measuring a physical property. This is because the spread of values for one grade of gasoline overlaps that for other grades. The probability of detecting a given interface can, however, be computed statistically for any given array of product values if the sensitivity of the detector is known.

Properties studied . . . After preliminary investigation covering a number of physical properties, density, dielectric constant, loss factor, and index of refraction were selected for further study. As a first step these properties were carefully measured for some 50 to 100 samples of each of four grades of gasoline being shipped through Great Lakes lines. On the basis of these results it was concluded that any of the three could be used to build a reasonably successful detection instrument.

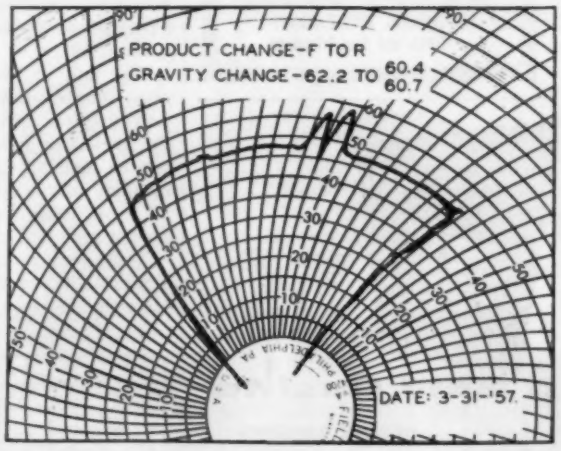
All showed characteristic overlap in values mentioned earlier. Treating the data by statistical analysis indicated that measurement of dielectric constant should give a slightly higher probability of detecting an interface than either of the others with instruments of the same sensitivity. Also, it was believed (possibly incorrectly) that this measurement would be the easiest of the three to instrument.

Field tests have been made of a gravity recorder and of several capacitance or dielectric recorders. In

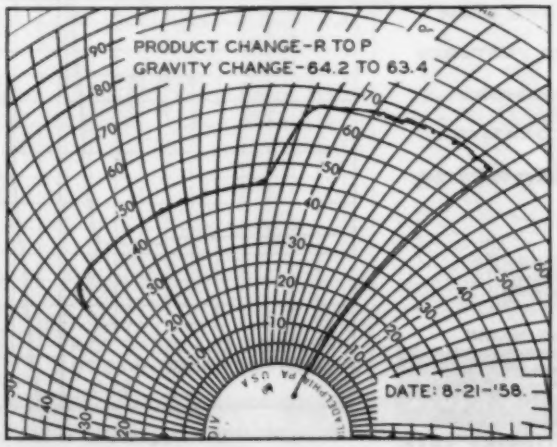
Presented at AIEE Petroleum Industry Electrical Conference, Dallas.



PRODUCT forms two arms of straight capacitance bridge with identical cylindrical condensers.



BRIDGE is thrown off balance as interface arrives.



FIXED CONDENSER replaces a cylindrical condenser in modification at Kansas City.

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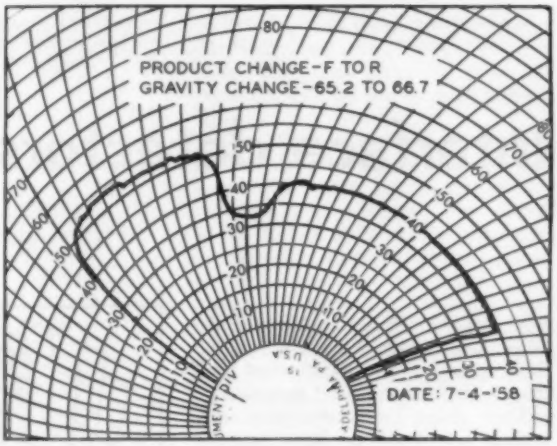


FIXED-CONDENSER instruments are usable at lower electrical sensitivity.

general the dielectric recorder has shown higher sensitivity but less stability than the gravity recorder.

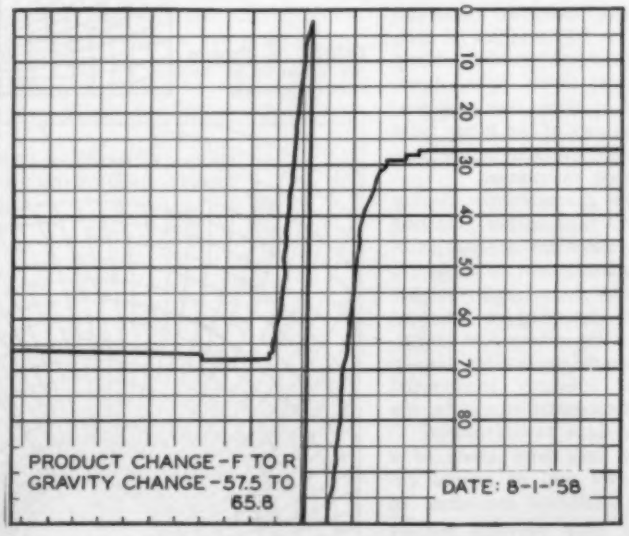
Capacitance-instrument tests . . . Two capacitance instruments have been on continuous test on our lines, one at West Tulsa installed in the fall of 1954 and one at Kansas City installed in the spring of 1955. In both instances the detector is located some 2,000 ft. upstream from the station with a recorder in the station so that advance warning of about 6-8 minutes is obtained.

The unit at West Tulsa has been quite successful. Station personnel report that they look for a signal on the dielectric indicator before going out to take gravity samples. At this location interfaces have traveled some 35 to 46 miles and give good signals on the recorder.

The second unit was installed at Kansas City in the spring of 1955. Here the interfaces have traveled from Barnsdall, 203 miles, or Tulsa, 237 miles, and are quite diffuse, giving much less definite signals on the detector. A great deal of time has been spent in an attempt to obtain the necessary sensitivity and also retain stable operation.

The device in its final form is an entirely new instrument having a straight capacitance bridge with identical cylindrical condensers through which product flows forming two arms of the bridge. With the same product in both condensers the bridge is in balance and no signal is obtained. As an interface arrives the bridge is thrown off balance with a resulting signal. Sensitivity can be increased by delaying arrival of the new product in the second cell.

In a later adaptation at the Kansas City station one of the cylindrical condensers has been replaced by a fixed condenser with good temperature compensation. This is preferred by many of our station personnel and



RESONANT frequencies of two circuits are compared.

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has the advantage of being usable at lower electrical sensitivity.

Problems . . . Fundamentally the dielectric method, or measurement of any physical property, suffers from three difficulties:

1. **Noise** caused by electrical instability or by passage or deposit of foreign materials in the line.

2. **The impossibility of detecting 100%** of the interface because of the overlapping of values.

3. **The necessity of interpreting** the sometimes complicated signal before determining the point at which to make a cut.

The first difficulty has been very greatly reduced by careful balancing of electrical components, regulation of voltage, and coating of the exposed surfaces of the cylindrical condensers with an insulating material. Occasional flushing of the condensers with only infrequent disassembly for cleaning seems to keep the equipment in good condition.

At the West Tulsa station cleaning of the condensers is seldom required (largely because of the relatively low sensitivity required). At Kansas City the unit has been operated as long as 5 months before cleaning was necessary.

In regard to the second difficulty, it is expected that if we should adopt this system, the dielectric difference between the two products bounding an interface would be measured before shipment with a simple dielectric bridge. In case the difference appeared too small a suitable flag could be injected. Also it is proposed to install another detector possibly 50 to 100 miles upstream from the receiving point to obtain early information as to the size and shape of the signal.

Sensitivity of the final detector could be adjusted accordingly. With this arrangement it is believed something less than 5% of the gasoline interfaces would require flagging. All interfaces involving fuel oils should be readily detected at a low sensitivity setting.

As to the third point, an operator, possibly remote, knowing the line fill which might be involved would decide the time of the product switch. If desired this could be readily adapted to push-button operation of distant valves.

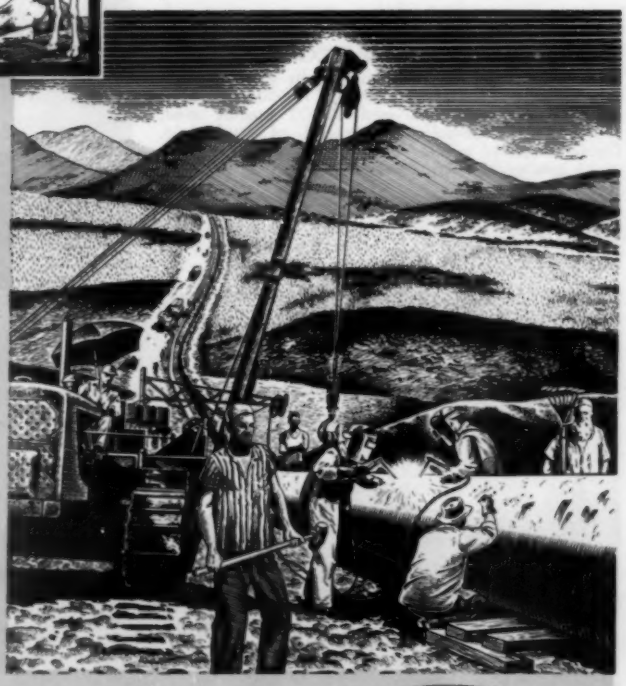
Measurement of a physical property, however, does have the advantage of not requiring injection of a flagging material with the accompanying possibility of error. It also enables the operator to follow the exact course of the interface even if a complicated line fill is involved. In addition, a bonus is present in that the record shows clearly the action of the valves involved in the introduction of a new product into the line and highlights any faulty or defective operation.

Resonant-frequency approach . . . In another recent approach the resonant frequencies of two circuits are compared. One circuit oscillates at a fixed frequency, the other contains a cylindrical condenser through which product is flowing. This is now on test with good results. It has a very high sensitivity and so far appears to have good stability.

The method of operation permits several excursions of the recording pen across a 5-in. strip chart. When the pen reaches the top of the chart the pen is very rapidly dropped to the bottom of the chart where it starts another excursion.

In order ultimately to enable the company to select the type of interface detector best adapted to our system we are also at present investigating the use of a new flagging material in a method providing for automatic injection and detection of the flag.

Pipelines are in the News



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DOWELL

BARBER COUNTY, KANSAS:
Although only slightly soluble in acid, the Mississippian chat formation responds well to Acid Petrofrac. Typical treatment: 1000 gallons fluid and 1000 pounds sand per foot of perforation, injected at 30 bpm. Results on gas wells are often ten times drill stem test.

YOUNG COUNTY, NORTH TEXAS:
Frac Acid usually obtains good results in the Caddo lime formation. Treatment example: 10,000 gallons 10 per cent thickened acid and 10,000 pounds sand, preceded by 500-gallon spearhead of Mud Acid. Treating material injected down casing at average rate of 33 bpm at 2200 psi maximum.

LINCOLN PARISH, NORTH LOUISIANA:
Stratafrac is often used in the Hosston formation with excellent results. It is designed to clean up fast and to suspend sand well at high temperatures. Recent treatment example: A new well was treated with 8500 gallons acid-kerosene emulsion, 2000 gallons low-surface-tension acid and 12,000 pounds sand. Pressures ranged from 4000 psi minimum to 6200 psi maximum. After treatment, initial open flow was 4100 mcfpd.

ECTOR COUNTY, WEST TEXAS:
In the Goldsmith Clearfork formation of the Permian Basin, Duofrac is frequently the answer to difficult production problems. A recent example: Before treatment the well would not produce. Dowell used a four-stage treatment—(1) 500 gallon spearhead of Mud Acid, (2) 10,000 gallons fresh water with de-emulsifying agent, (3) 25,000 gallons 7½ per cent acid with de-emulsifying agent and 25,000 pounds sand, and (4) 10,000 gallons fresh water with de-emulsifying agent as a flush. Potential after 35 days was 360 bopd. After 95 days, 273 bopd.

DOWELL OFFERS FOUR COMBINATION ACID/FRACTURING SERVICES—HERE'S WHY

There are many cases where formations do not respond well to either acidizing or fracturing treatments alone. Frequently, however, these same formations show high production increases and flatter decline curves when given a treatment combining chemical acidizing and mechanical fracturing. Dowell has developed and field-proved four such acid/fracturing services. If you have had poor production results with either acidizing or fracturing alone, one of the Dowell acid/fracturing services, described here, may be the answer to your specific well problem.

ACID PETROFRAC*—Developed primarily for use in limestone and dolomitic formations, Acid Petrofrac employs an acid-in-oil emulsion. The fluid may be mixed to almost any desired thickness, and the acid concentration can be varied from one to fifteen per cent. The emulsion used in this service has low friction loss and excellent sand-carrying properties. Its retarded acid properties allow deep penetration before spending, and its silicate control properties are designed to provide clean flow channels for better, longer-life wells.

DUOFRAC*—This new Dowell service was developed especially for use in limestone and dolomite formations containing salt. Duofrac uses fresh water, light acid concentrations, and sand. The water in Duofrac acts to dissolve the salt present, while the dilute acid attacks the limestone or dolomite. The amount of acid used in each treatment depends on the characteristics of the producing formation. Treatments are usually made with large volumes and at high-injection-rates.

FRAC ACID*—Developed for use in formations of relatively high solubility, Frac Acid employs thickened, inhibited hydrochloric acid carrying suspended sand. After a controlled length of time, the thickened fracturing fluid reverts to water thinness. The sand is retained in the formation. Frac Acid contains more acid by volume than any other acid/fracturing service offered by Dowell.

STRATAFRAC*—Stratafrac uses an acid-kerosene emulsion with sufficient body to carry sand in suspension. The materials used in this service may include agents to reduce silicate swelling, and to dissolve clay and silicate particles in the formation. The acid concentration and the size and amount of sand used in Stratafrac can be tailored to fit formation conditions.

For more information on Dowell's acid/fracturing services, contact your local Dowell engineer. He will help you select the service best suited to the conditions of your well. Call any of the 165 Dowell service points. In Canada, contact Dowell of Canada, Ltd.; in Venezuela, contact United Oilwell Service. Or write Dowell, Tulsa 1, Oklahoma.

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Big drilling projects may herald upswing in exploration activity

TWO MORE sizable drilling programs are being initiated in what may be another sign of an impending step-up in exploration and development activity after the first of the year throughout the U. S.

One calls for the drilling of 12 exploratory wells spread over five states, including California, Washington, New Mexico, Utah, and Colorado. The other is an eight-well project in the Fulcher Kutz area of San Juan County, northwestern New Mexico.

The 12-well program is a joint project of Intex Oil Co. and South Penn Oil Co. with the former as the active operator. Three of the wells already are under way. Two are in Colorado, one a 3,150-ft. Ouray test in Ouray County, in the southwestern part of the state, and the other a 4,750-ft. Frontier test in the Oak Creek area of Routt County, in the northwestern part of the state. The third test under way is in the Newhall area of Los Angeles County, California.

Sunset International Petroleum Corp. has the eight-well program in the Fulcher Kutz area of San Juan County, New Mexico. It has budgeted $1,000,000 for the project. The wells will be drilled on the company's 4,900-acre spread of leases. They will be in addition to two gas wells already completed by this company in the area. These are productive from the Dakota formation in three intervals from 6,333 to 6,492 ft.

New company takes over Texas drilling operation

THE FORMER Crews Drilling Co., of Alice, Tex., is being supplanted by a newly formed company operating as Gulf States Development Co.

Tom Crews, who headed the former company as principal owner, is president of the new company. Associated with him are R. W. Roach, vice president in charge of production; H. J. Mosser, Neal Merrit, B. T. Parr, and Walter Maguire, directors. Robert Keehan heads the land department.

Crews Drilling Co., which has been an active contract drilling and operating firm in South Texas, has been dissolved.

The newly formed firm is starting with one rotary rig, but plans to add others early in 1959. It will have offices at Alice with Carlos Galindo as manager; Corpus Christi, with Merrit in charge; and Houston, headed by Mosser.

Who's getting the drilling contracts

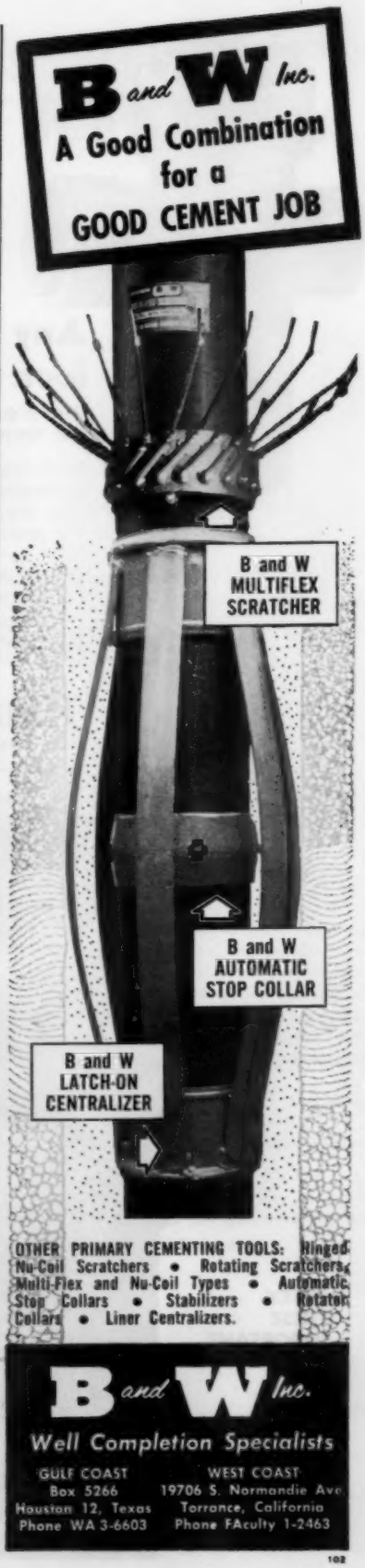
Howard Parker Drilling Co., Houston, is on a new 10,000-ft. drilling job for Scurlock Oil Co., also of Houston, in Austin County, Texas Gulf Coast. Location is listed as 1 Charles Zaruba. It is in the H&TC Survey 183, about 4 miles west of Sealy.

Drilling & Exploration Co., Inc., Dallas, is the contracting company on the deep wildcat Olin Oil & Gas Corp., Shreveport, is starting in Union Parish, North Louisiana. Olin's location, listed as 1-R Fee, is 4 miles west of Marion, in the northern part of the parish. Spot is in 13-22n-1e. Plans call for a test to the Smackover. Permit is for 9,000 ft.

Boyd & Durst Drilling Co., Alice, Tex., is on a new wildcat operation in the Arneckeville area, southwestern DeWitt County, Texas Gulf Coast. It is a contract job for Gulf States Development Corp., which plans an 8,000-ft. test. Location, 1 Koehler, is just northwest of town in the Charles Amsler Survey.

An-Son Drilling Co., Oklahoma City, has moved a rig to the new North Buffalo area of Harper County, western Oklahoma, where it is drilling for An-Son Petroleum Co., its parent operating company. This is An-Son's initial operation in this field, opened last summer by Sinclair Oil & Gas Co. with production from Arbuckle lime. Sinclair is completing its second well, opening three additional shallower producing zones in the Pennsylvanian. An-Son's well is to be taken to the 7,900-ft. Arbuckle objective.

Douglas Drilling Co. is contractor on a 4,550-ft. well Drew Cornell,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Inc., Lafayette, La., is drilling in the Erwinville area of West Baton Rouge Parish, southern Louisiana. Its location is at 1 Baist Cooperage, in 97-7s-10e, about 15 miles west of Baton Rouge.

Musgrove Petroleum Co., Wichita, Kans., has a rig working on a contract operation in southwestern Stanton County, in far-southwestern Kansas. It is drilling for Robert J. Beams at 1 Burchfield, a 5,600-ft. Morrow test. Location, spotted in 30-29-42, is 4 miles southwest of Mantor, and about the same distance north of Sparks field, nearest production.

Dorris Ballew, Inc., Natchez, Miss., has a new contract operation in the Bougere area in Concordia Parish, eastern Louisiana. It is for R. A. Campbell, Vidalia, La., operator. Contract calls for a 7,250-ft. Wilcox test at 1 Laub, in 36-4n-8e. Location is 2½ miles southwest of Brabston field, nearest production.

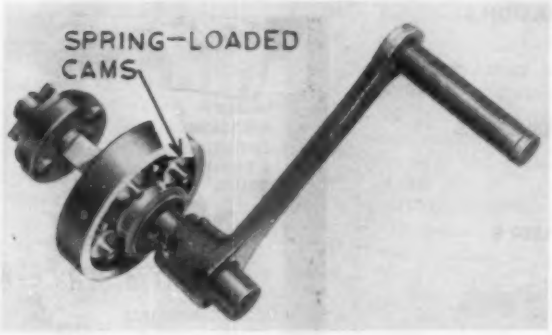
Kern Drilling Co., Inc., Magnolia, Ark, is on a new 7,500-ft. drilling job in eastern Columbia County, South Arkansas. It is for Horizon Oil Co., Inc., of El Dorado, Ark., whose location, at 1 Gunnels, in 21-17s-19w, is 2 miles southwest of Village, and about a mile from production. Objective is the Smackover formation.

Grantham & King, Oil City, La., are drilling on the third of a series of Lower Cretaceous tests Russell Brothers, of Magnolia, Ark., are putting down on their 400-acre block 6 miles northeast of Stamps, in northeastern Lafayette County, southwestern Arkansas. All tests are on the Kitchens lease. It is 3,200-ft. drilling.

Sage Drilling Co. has a rig running for Lion Oil (Monsanto Chemical Co.) on a wildcat location in southern La Plata County, southwestern Colorado. This new operation is scheduled as a 5,340-ft. Mesaverde test. Location, at 1 Ada, in 25-33n-11w, is about 15 miles southwest of Durango, and about 4 miles north of the New Mexico line.

Sabre Drilling Co., Cushing, Okla., has a 5,700-ft. contract with Olin Oil & Gas Co. for a Misener test on the west edge of Northeast Harrah field, east of Oklahoma City, on the east edge of Oklahoma County, Oklahoma. Olin's well, 1 Laughlin, in 12-12n-1e, is on a recently acquired block extending eastward into Lincoln County.

This week's SHOWCASE features . . .



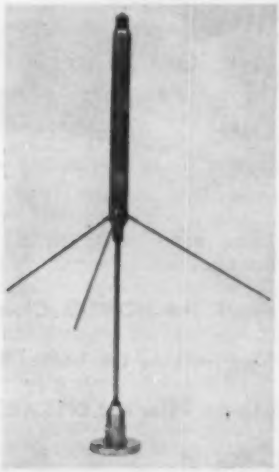
Crank makes engine starting safer

. . . for those started with a rope or crank. It does this by eliminating dangerous "kick-back" often encountered.

The crank has four cams which are spring-loaded against the shaft hub. These allow the crank to turn in one direction only. When the engine kicks back, the cams jam against the hub, stopping the kickback instantly.

The safety crank also has a friction clutch to let the engine move in a reverse direction and so prevent damage to the crankshaft or adaptor.

The crank fits any engine started by a rope or crank. **Write or call: Win-Well Mfg. Co., Box 412, Tulsa, for details on safety crank for starting engines.**



Five-foot caliper for well surveys

. . . has been developed. The new caliper increases inside-diameter measurements in downhole operations to 5 ft. The caliper can be used: (1) to measure washouts while drilling LPG storage wells, (2) in fishing operations where hole size has a bearing on the type of fishing tools used, and (3) in many other specialized problems requiring large downhole measurements.

The caliper has also been incorporated with a computer to determine annular volume. **Write or call: Worth Well Surveys, Room 238, Capitol Building, Midland, Tex., for details on 5-ft. caliper.**

●

Grease resists liquid fuels

. . . and solvents. It thus provides lubrication of pump and other bearings and sliding surfaces in the presence of liquid fuels and solvents. In this way, it overcomes the problems associated with older types of greases which are dissipated by the washing action of those liquids. **Write or call: Pennsylvania Refining Co., 2686 Lisbon Road, Cleveland 4, for details on solvent-resistant grease.**

●

Pipe-tapping machine does two jobs

. . . as it permits ½ to 2-in. hot taps through gate or plug valves into pipe or tanks, and it can be used to install scraper-passage indicators and to install and remove gage adapters, thermometer wells, corrosion test coupons, etc., without shutdown of the piping system.

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taps may be made on lines in service at pressures up to 1,440 psi. at 100° F. or at 700 psi. at 700° F. The gearing system used allows the boring bar to be rotated without travel and to be extended without rotation.

Planetary gears provide automatic drill feed. And a selective clutch provides a fast feed for advance and retraction and a fine feed for cutting. Maximum boring-bar travel is 18 in. The machine weighs 44 lb. **Write or call: T. D. Williamson, Inc., 2733 East Latimer, Box 4038, Tulsa, for details on Model 100-C tapping machine.**

●

Gravity meter comes in three classes

. . . in both standard and geodetic models. The maker has used a fabricated quartz meter system sealed in a partial vacuum to make the meter essentially independent of temperature and altitude effects.

Depending upon the class and model, the meter ranges in weight from 7½ to 10½ lb. Features include an increased small dial range and 90° latitude temperature compensation. Another feature is a low-power temperature stabilizer to obtain a high degree of linearity for all gravity readings, regardless of the range and severity of temperature fluctuations. The temperature stabilizer is powered by four D-size flashlight batteries.

An advantage cited for the Master gravity meter is that its extreme accuracy requires a minimum number of base ties during field surveys. This, in turn, increases field crew production and operating efficiency. **Write or call: Texas Instruments, Inc., Industrial Instrumentation Div., P. O. Box 6027, Houston 6, for details on gravity meter.**

Grooved steel tubing quickly joined

. . . by mechanical couplings. The light-wall tubing is mill-grooved and electric-resistance-welded. It is particularly suited for temporary semi-permanent, or permanent piping systems.

An advantage cited for the tubing is that its uniform thickness combined with simple mechanical couplings permits selecting the proper wall thickness for the pressure and conditions of the job.

When combined with the proper

style couplings, the tubing forms a piping system that will absorb contraction and expansion. The quick-assembly couplings alleviate the need

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BRADEN truck winches have built in safety features that are so important to any operator. The finest materials and workmanship assure maximum performance when you need it most. Rated capacities are established with high safety factors to assure safety during overloads. The BRADEN Oil Cooled, Fully Adjustable, Automatic Safety Brake is the best in the business, so any load can be kept under perfect control at all times.

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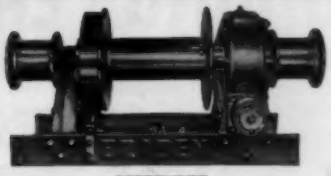
M512-18B

This model has a rated capacity of 30,000 pounds. Designed for heavy-duty trucking and other tasks requiring the movement of loads between 10 and 15 tons.



M518-18B

Rated capacity: 45,000 pounds on first layer of cable. Unusually sturdy and powerful for handling heavy equipment of all types with complete safety.

Write for Catalog

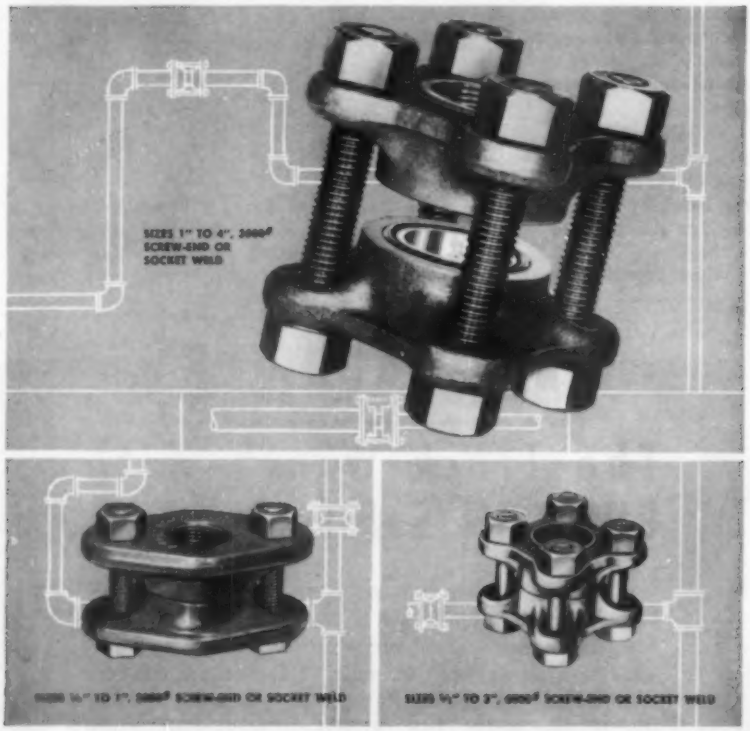
BRADEN WINCH COMPANY

P. O. Box 547, Broken Arrow, Oklahoma

BRADEN Winches

In service around the world

The double diamond assures double value



Installation flexibility with permanent piping strength

GET BOTH WITH W-S O-RING FLANGE UNIONS

NOW, you can install high pressure piping systems that can easily be rearranged and adapted with full assurance that the unions will give the leak-proof service of permanent installations. This is made possible by these adaptable features of W-S O-Ring Flange Unions:

- Available in 2-bolt and 4-bolt types, according to size.
- Available in Screw-end and Socket Welding Types—3000# and 6000#.
- Sizes ¼" to 1" in 2-bolt 3000#; sizes 1" to 4" in 4-bolt type 3000#; sizes ½" to 3" in 4-bolt type only 6000#.
- O-Rings available in a variety of materials for a wide range of service.

Specify forged steel W-S O-Ring Flange Unions for a tight seal against fluid pressure in piping for hydraulic machinery, refrigeration piping, steam and water lines, process liquid and gas lines, and many other applications.

For full specifications, write for Bulletin U-1-58

W-S manufactures a full range of high quality drop forged fittings, unions and couplets . . . in carbon, stainless and alloy steels. For full information about these products, or for your specification forging requirements, write to: W-S Fittings Works, H. K. Porter Company, Inc., Box 95, Roselle, N. J.

H. K. PORTER COMPANY, INC.

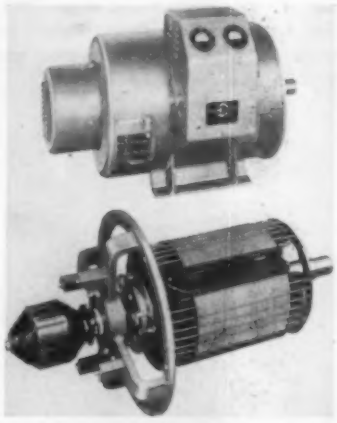
FORGE AND FITTINGS DIVISION

W-S Fittings Works, Roselle, N. J. • Cleveland Forge Works, Cleveland 4, Ohio
Stainless Steel Works, Duncannon, Pa.

for fixtures for holding coupling devices.

Applications for the tubing include gathering and flow lines, plant piping, fire sprinkling systems, and temporary air and water lines for construction. **Write or call: Republic Steel Corp., Steel and Tubes Div., 224 East 131st. Street, Cleveland 8, for details on mill-grooved steel tubing.**

●



Brushless a.c. generator doesn't spark

. . . and so provides added safety in hazardous atmospheres. The generator has no commutator, slip rings, nor commutator and slip-ring brushes.

It is available in ratings of 6.25 through 187 kva. complete with static voltage regulator and meters at speeds of 1,200 and 1,800 r.p.m. Silicon rectifiers are used to replace the conventional commutator. Six are used. They mount on a ring that rotates with the generator rotor.

An a.c. exciter furnishes current to the rotating rectifier assembly. The rectifiers, in turn, supply d.c. current for the generator field. Besides their nonsparking feature, brushless generators require virtually no maintenance. **Write or call: Electric Machinery Mfg. Co., 821 Second Avenue, South East, Minneapolis 13, for Publication 2100-PRD-255.**

●

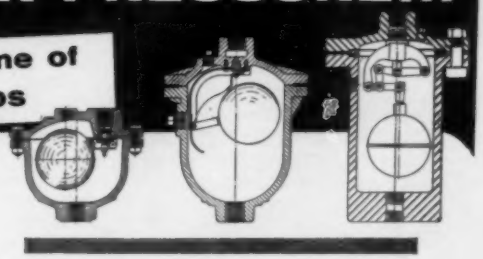
Horizontal split-case pumps

. . . handle either hot or cold water. They are available in shaft-sealed types in 1½ and 4-in. discharge sizes and in packing-gland types in 4 to 8-in. discharge sizes.

Capacity and head ranges of the packing-gland types go up to 2,600 g.p.m. and up to 280 ft., respectively. Capacity and head ranges of the shaft-sealed types go up to 950 g.p.m. and up to 350 ft., respectively. Liquid temperature limits for the shaft-sealed

FOR BETTER VENTING OF GASES FROM LIQUIDS UNDER PRESSURE...

Select from the complete line of Armstrong Ball-float Traps



Corrosion-Resistant Parts—stainless steel standard . . . also available in nickel, monel, various grades of stainless, and other weldable materials which can be fabricated, cast or forged.

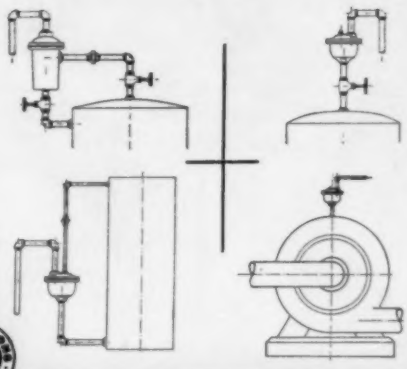
For Any Pressure—special designs for particular needs . . . standard to 1000 psi.

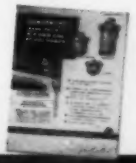
For Any Capacity—three types for most economical application to your conditions.

Moderately Priced—due to mass-production economies from using many of the same basic parts used in the production of thousands upon thousands of Armstrong steam traps.

Fast Service—by qualified Representatives around the world.

Unconditionally Guaranteed—to satisfy on a money-back basis.





Send for Helpful Bulletin—Bulletin 4501 tells how to select and install gas-relief traps, gives complete physical data and prices of Armstrong vent traps.

For your copy, call your local Armstrong Representative or write today to:

ARMSTRONG MACHINE WORKS
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Offers a fund of basic information

PETROLEUM GEOLOGY

By Kenneth K. Landes, University of Michigan

This practical work provides useful field data on the occurrence, distribution, and technique of location of gas deposits and oil reservoirs—plus a clear explanation of the theories developed to explain the origin, migration, and accumulation of oil and gas. ". . . deserves commendation," say *Geophysics Magazine,* "for its many fine illustrations . . . ; its wealth of references, which completely document every facet of the discussion and indicate an amazing familiarity with the literature . . . ; and for the informal style of writing which keeps the material interesting in spite of a mass of facts and data that in the hands of a less skilled author would consign the book to dusty references shelves." 1951. 660 pages. $11.00.

THE OIL AND GAS JOURNAL
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ROBERT F. CASHEN — Manager Petroleum Department

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Seasons Greetings

Wilson Manufacturing Co., Inc.
WICHITA FALLS, TEXAS, U.S.A. THE HOME OF RED IRON

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types is 180° F. For the packing-gland types, it is 250° F. Motor sizes range from 1 to 75 hp.

One advantage of the horizontal split-case Aqualine pumps is that the split is at the center line of the pump shaft, making it easy to inspect or maintain the rotating parts. **Write or call: Peerless Pump Div., Food Machinery & Chemical Corp., 2005 Northwestern Avenue, Indianapolis 8, for Bulletin B-2100.**

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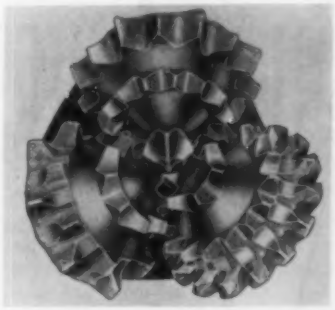

Bit promises faster drilling rate

. . . through the use of chisel-shaped, deeply cut teeth spaced to give the greatest depth of penetration. The W4DT bit both cuts fast and keeps the hole to gage, the maker reports.

Both the number 1 and number 2 cones are deleted on the heel, and the number 3 heel row is T-shaped for gage wear. The bit is recommended by the maker for a drilling-weight range from 1,000 to 4,000 psi. per in. of bit diameter and for rotary speeds from 150 to 75 r.p.m., decreasing as weight is applied. **Write or call: Oil Tool Mfg. Co., Inc., P. O. Drawer 24, Tonkawa, Okla., for details on W4DT drill bit.**

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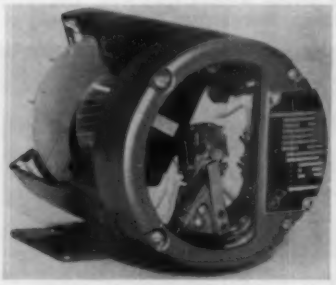
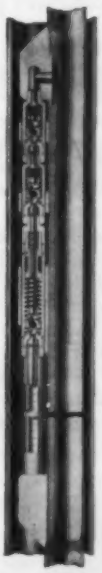


Motor has sealed starting switch

. . . to prevent motor failure due to malfunctioning of the switch mechanism caused by dirt, dust, oily accumulations, and processing material fines. The single-phase motor has its switch,



Patented

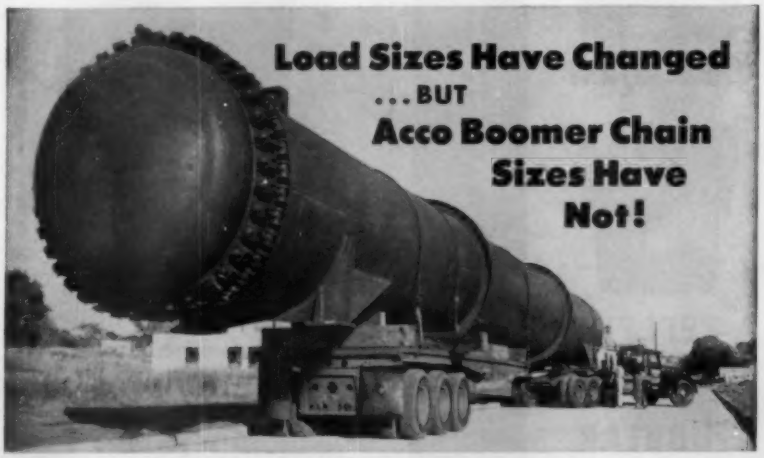
TIME TESTED MACCO GAS LIFT

BOTTOM HOLE CHEMICAL INJECTION VALVE
MACCO "Outside Mounted" Chemical Injection Valve Assembly

This valve affords an effective and proved method of inhibiting corrosion **by adding exactly controlled amounts of chemical inhibitors into the tubing . . .** without losses, regardless of pressure conditions or pressure variations inside the tubing. This is accomplished by pumping the inhibitor into the annulus (filled with 40 parts carrier fluid to 1 part inhibitor, for example) and forcing it through the chemical-injection valve set above a packer. Since this system is hydraulic, the quantity entering the tubing will be the same as the quantity pumped into the annulus at the surface. Thus, varying pressure conditions inside the tubing do not affect the amount of inhibitor injected. This method provides protection for three surfaces in one operation—the inside and outside of tubing plus the inside of the casing. (This process is fully patented by Macco Oil Tool Company, Inc.)

Write for additional literature or information.

MACCO OIL TOOL COMPANY, INC.
Phone UN 1-1253
1521 Prince P. O. Box 7288 Houston 8, Texas



• Year after year, trucks have been called upon to carry heavier loads in all phases of petroleum operation. And yet, while load sizes have skyrocketed, the size of chain necessary to do a safe, effective tie-down job has remained nearly the same. Ever wonder how this can be? It's due primarily to technological advancements in the manufacture of chain from better grades of steel which make it possible to move heavier loads faster at no appreciable increase in chain size or weight. • An outstanding example of such a chain is ACCO Boomer Chain. Made from High Test Steel or Accoloy steel in 20-foot lengths, they have drop-forged Alloy Grab Hooks (I-Beam Type) on each end. The hooks are factory attached and factory proof-tested. High Test Boomer Chains come in six sizes, from ¼" x 20 ft. through ⅝" x 20 ft. Chains of Accoloy are made in four sizes, ⅜" x 20 ft. through ⅝" x 20 ft.

ACCO

American Chain Division
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Bridgeport, Conn. • Factories: *York and *Braddock, Pa.
Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, New York, Philadelphia, Pittsburgh, *Indicates Warehouse Stocks *Portland, Ore., *San Francisco

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TUBULAR

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•
Large Chamber Reflex Gauges
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STRAHMAN VALVES, Inc.
16 Hudson St., New York 13, U.S.A.

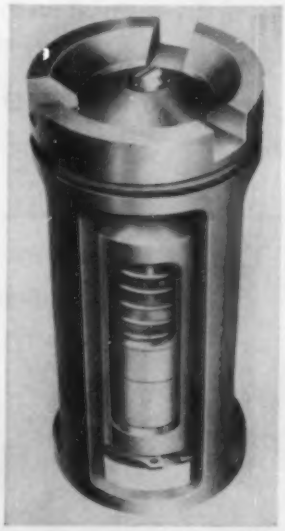
thermostat, capacitor, and terminal board completely contained.

The switch package is designed for inspection and checking of the switch without damaging the container's protection efficiency.

Other features of the motor include prelubricated ball-bearing construction. A "locked-bearing" arrangement provides constant, even transfer of power from the motor to the driven machine, minimizing power loss and belt, pulley, and bearing wear on the driven machine.

The motor is available in a general-purpose 56 frame with a rigid base in ratings of ⅓ through 1½ hp. and as a blower motor in a 56 frame with a resilient base in ratings of ⅓ through 2 hp. **Write or call: A. O. Smith Corp., Electric Motor Div., Tipp City, Ohio, for details on single-phase motor with sealed switch.**

•



Inclinometer for air drilling

. . . gives a surface indication of drill-hole inclination each time a joint of pipe is added to the drill string. Called the Fluid-Flow inclinometer, the instrument is positioned in the float recess directly above the drill bit. It remains in the drill string continuously.

Operation of the instrument is achieved by pressure acting on a spring-loaded plunger head. A plumb bob hangs from the plunger head over a calibrated orifice. If hole inclination is less than the inclination limit of the inclinometer, the plumb-bob nose passes through the orifice, allowing full passage of gas past the plunger head. But if inclination exceeds the limit, the plumb bob swings over and engages a stop that holds the plunger head in a closed posi-

ALLIS-CHALMERS

ALLIS-CHALMERS

NEW brochure of ideas for modernizing

This booklet is based on the premise that modernization can start anywhere in your plant. It can be a single machine or operation . . . a better way of getting variable speed . . . a faster way to braze . . . or a newly available replacement. In fact, this type of updating is far more common than the sweeping change.

Get a copy of "59 ideas for modernization in '59" from your nearby A-C office or write Allis-Chalmers, Industries Group, Milwaukee 1, Wisconsin.

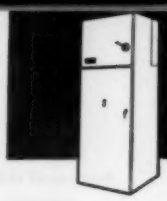
New motor development may eliminate premiums you've been paying for specially protected motors.

Electrical modernization includes placing substations close to machines being served.

ALLIS-CHALMERS

A-5850

Newly designed
Type H Motor Control



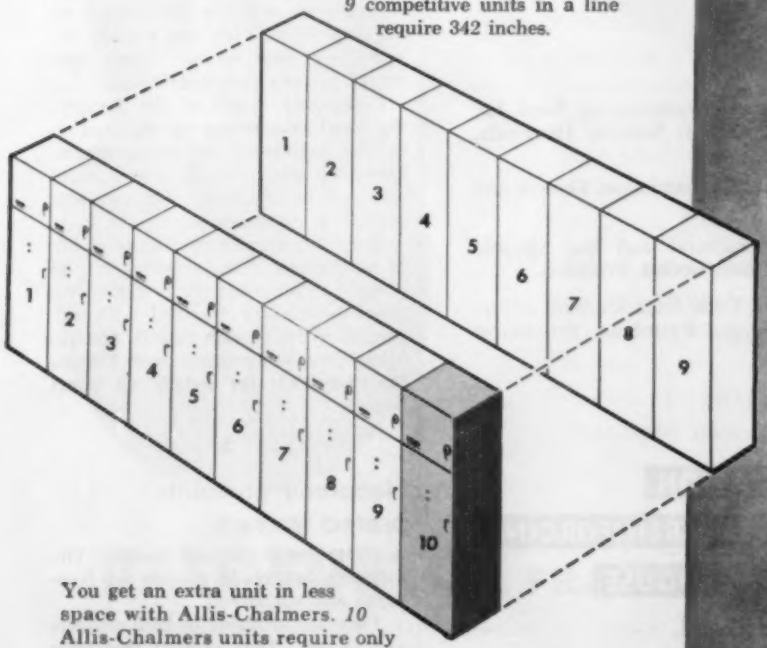
Saves valuable plant space

Newly designed Allis-Chalmers high voltage control units are only 34 inches wide. This means you can put 10 Allis-Chalmers cabinets in less space than required by 9 competitive 38-inch units. In addition, the narrower width means less space required for door swing. Result: You save a total of 2.36 sq ft of floor space per unit. On 10 units, this means a saving of 23.6 sq ft.

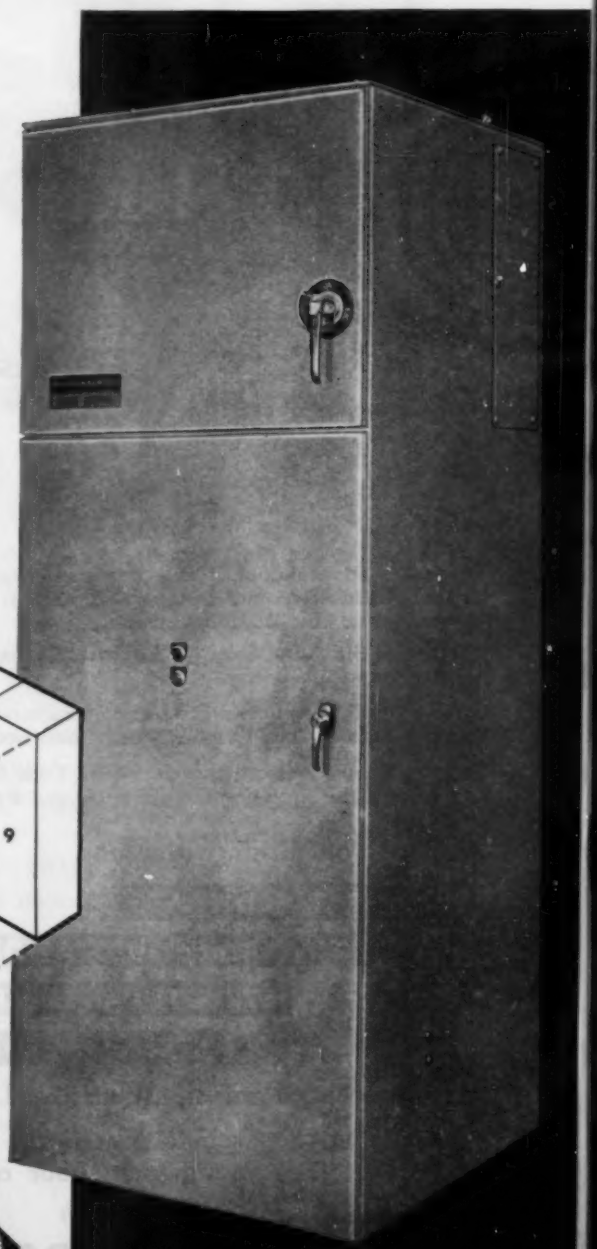
Smaller size is only one of many advantages in this new Allis-Chalmers design. You also get full-front access, more room for optional features, a completely tested unit, and the ultimate in protection for men and machines.

For more information on how this new control design can help you, call your nearest Allis-Chalmers representative, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

9 competitive units in a line require 342 inches.



You get an extra unit in less space with Allis-Chalmers. *10* Allis-Chalmers units require only 340 inches.



ALLIS-CHALMERS

A-5518

Fabricated Structural Steel and Fabricated Reinforcing Steel for Bridges, Commercial and Industrial Buildings: Schools, Hospitals, Power Plants, Coal Washing Plants.

Galvanized Structural Steel for Electrical Transmission Towers and Substations.

Carbon Steel Warehouse Products: Structural and Bar Shapes, Plates, Hot and Cold Finished Bars, Construction Products.

Pressure Vessels fabricated to the ASME Code from Carbon, Alloy, and Alloy Clad Steels for the Chemical and Petroleum Processing Industries.

At Flint, four distinct divisions,

FABRICATED PLATE

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are inter-related and singly managed.

Flint invites you to investigate the possibility of using these facilities to your advantage.

for over 40 years

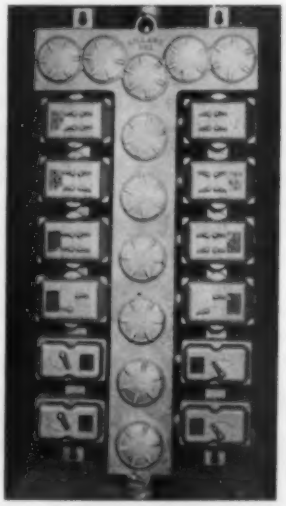
FLINT STEEL CORPORATION

TULSA . . . MEMPHIS

tion. It thus shuts off flow and causes an immediate pressure buildup which is indicated by a surface pressure gage.

The inclinator is available for float-recess sizes of 3½ and 4½ in. **Write or call: Sperry-Sun Well Surveying Co., 3118 Blodgett Street, Houston, for details on Fluid-Flow Inclinometer.**

●



Explosionproof panel boards

. . . are now available constructed of cast aluminum. They are sturdily designed for long service. Their light weight permits easy installation.

Completely wired at the factory, the panel boards can be obtained to fit the individual job requirements. They are available in several sizes and can be obtained with any size protective equipment.

Their interior design affords plenty of hand room. Branch circuits can be brought through the top or sides. The panel boards are UL and CSA approved. **Write or call: Killark Electric Mfg. Co., Vandeventer and Easton, St. Louis 13, for details on panel boards.**

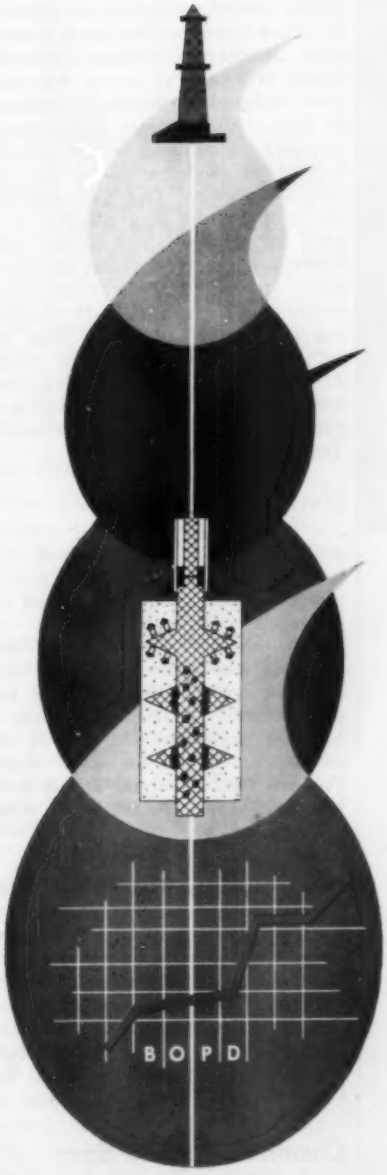
●

Neoprene garments protect workers

. . . from grease, oil, and weather. The garments are made entirely of Neoprene and vulcanized.

They are available in both trousers and jackets. Tests showed that after 4 years of storage the garments exhibited little or no change in waterproofness, flexibility, breaking strength, weathering resistance, or the ability to withstand laundering. **Write or call: Dri-Tex Rubber Apparel, Inc., 1601 South Michigan Avenue, Chicago 16, for details on garments.**

multiply your well's chance for success...



HALLIBURTON MULTIFRAC!

Applicable to all types of fracturing fluids, Halliburton MULTIFRAC has had a high record of success in all areas for increasing production. MULTIFRAC helps get *more* out of *many* pay zones.

MULTIFRAC produces additional fractures at different levels of the formation so that increased drainage can be obtained for greater possibility of profitable recovery. MULTIFRAC does not require segregation of individual zones by packers... especially adaptable for sections of open hole too large or otherwise unsuitable for packers. Other very successful applications include producing sections with great thickness and where perforations in casing are closely spaced.

The many flow channels opened by MULTIFRAC multiply your chances of improved recovery and usually produce faster and longer than a single fracture. Put the multiple benefits of MULTIFRAC in your well; call your local Halliburton Representative for all the facts about this outstanding stimulation treatment.

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STEEL FORGINGS, INC.
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Weld Saddles.

VOLCANO BURNER COMPANY
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Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels Prevents spillage—easily loaded.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

SHOWCASE . . .

New Literature

New turbine-type meters

. . . for custody transfer are outlined in a new four-page reprint of a technical article which summarizes the results of 3 years of testing. The tests were designed to develop a medium to high-capacity meter with enough accuracy to be used in the custody transfer of crude petroleum and petroleum products. Two 6-in. and one 3½-in. meter are now available as a result of the tests. The bulletin also includes meter photos and accuracy-curve graphs. A 22 by 17-in. chart showing automatic custody transfer systems is also available. **Write or call: Pottermeter Co., U. S. Route 22, Union, N. J., for New Turbine-type Meters for Custody Transfer bulletin and/or Automatic Custody Transfer Systems chart.**

Rims, wheels, tools

. . . and rim accessories for vehicles are highlighted in a new 82-page multipurpose catalog of engineering data now obtainable. The text includes information and pictures on rim research, step-by-step procedure for mounting and demounting rims, and operating instructions for using hydraulic tools. The catalog includes a listing of names and addresses of rim distributors. **Write or call: Metal Products Div., Goodyear Tire & Rubber Co., Akron 16, Ohio, for Rims catalog.**

Fuel-booster, transfer pumps

. . . with air-breathing propulsion systems are detailed in two new bulletins, four and eight pages. The bulletins contain photographs, illustrated cutaway drawings, and applications of the pumps. **Write or call: Nash Engineering Co., 242 & 338 Wilson Road, South Norwalk, Conn., for Centrivac Fuel-Pumps bulletins.**

Chemical-reaction data

. . . is packed into a new revised 40-page booklet—Physical and Thermodynamic Properties of Elements and Compounds. The booklet includes: (1) listing of enthalpies and heat capacities of many common elements and compounds; (2) equilibrium constants for several common reactions; (3) information for computing equilibrium constants for other reactions; (4) values of many constants; (5) conversion factors; (6) steam tables; and (7) the periodic table. The booklet also contains enthalpies, heat capacities and equilibrium-constant informa-

tion for three gases — propadiene, methyl acetylene, and cyclohexane— and equilibrium data for carbonyl sulfide. **Write or call: Girdler Catalysts, Chemical Products division of Chemetron Corp., P. O. Box 337, Louisville 1, Ky., for Physical and Thermodynamic Properties of Elements and Compounds booklet.**

Operating experience with gas turbines

. . . in the 750 to 1,000-kv. range is illustrated in new 16-page Bulletin 167. The bulletin discusses salient design features, types of fuels (natural gas, distillate, and crude oil) plus applications in oil fields and process industries. It includes an assessment of the integrated turbine—boiler package and likely trends in turbine application. **Write or call: Clark Bros. Co., Lincoln Avenue & Fifth Street, Olean, N. Y., for Bulletin 167.**

How draft affects the combustion process

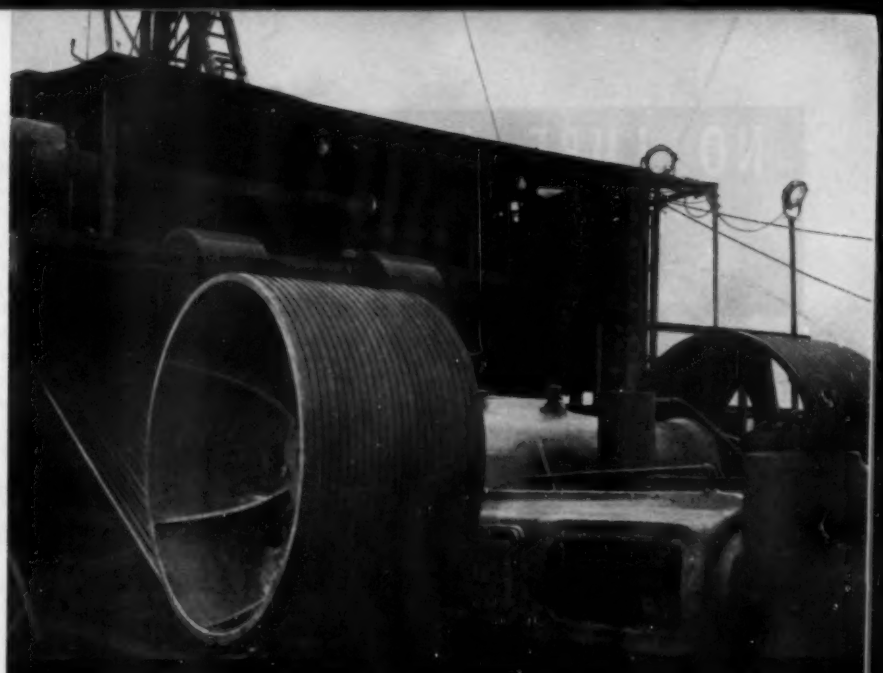
. . . along with details about various types of draft gages are detailed in new 20-page Bulletin 58-S201. The bulletin is divided into four sections: (1) what draft is; (2) how draft is measured; (3) what the draft gage tells; and (4) how to select the draft gage to suit particular requirements. The bulletin includes details on draft gages for measurement of low pressure, draft, and differential. **Write or call: Hays Corp., 742 East Eighth Street, Michigan City 18, Ind., for Bulletin 58-S201.**

Basic blowout-preventer control

. . . systems—five in all—are outlined in a new 20-page fully illustrated bulletin. The systems include: (1) air-pump operated with accumulators; (2) air-pump-operated units; (3) electric-pump-operated units with accumulators; (4) steam, air, or gas-operated units with accumulators; and (5) units custom-built to customer's specifications. The bulletin offers a description of each unit, performance ratings, along with formulas, solutions, and proofs. **Write or call: Stewart & Stevenson Distributing Co., P. O. Box 1637, Houston, for Koomey Blowout Preventer Operating and Testing Units bulletin and/or Current Price List publication.**

Exhibit and display plant

. . . is described in a new folder now available. The plant, which is located only 7 minutes from the site of the 1959 International Petroleum Exposition to be held May 14 to 22 in



For dependable power transmission
. . . depend on THERMOID

POWERFLEX
MULTI-V BELTS

On rigs, compressors and pumps, these *premium* heavy-duty belts stay "on-the-job" longer and provide maximum power transmission. You save time and money because belt wear *and* resultant belt changes are reduced to a minimum.

Pre-stretched to assure long-lasting dimensional stability, Thermoid *Powerflex* Multi-V Belts have the strength and flexibility to absorb the repeated shock loads of heavy-duty oil field service. *And* when you replace with Thermoid *Powerflex* "matched sets", the load on the belts is equalized—fresh replacement belts are *not* left pulling the load for "lazy" old belts. Belt replacement is one *fast* operation. Downtime and maintenance costs are cut to the bone.

Order Thermoid Powerflex Multi-V Belts and Thermoid Brake Blocks and Hose for all oil field applications from your supply store or nearest Thermoid Warehouse.

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Thermoid Company
Trenton, N. J. • Nephi, Utah

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Abilene, Texas	Casper, Wyo.
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For rugged oil field service, always specify Thermoid Brake Blocks.

NO LUBE MAINTENANCE..
TIGHT SHUT-OFF...
POSITIVE OPERATION

PERFECT for Automatic Custody Transfer!

DeZurik Control Valves completely eliminate problems that can arise with other valves on A.C.T. For instance, DeZurik Valves need no lubrication to deliver dead-tight shut-off; they respond **instantly** to control signals. Get the complete story from the DeZurik representative in your area, or write for details.

DeZurik Control Valves are available in sizes ½" thru 20", with on-off or positioning pneumatic or hydraulic operators, in a full range of materials.

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SARTELL, MINNESOTA

"YARD WORK" done the easy way . . .

H & M pipe beveling machines mean speed and accuracy on ANY size of pipe!

H&M Pipe Cutting and Beveling Machines offer the easiest, quickest and most efficient solution to preparing pipe for welding, even by untrained operators.

One man can handle and operate any size H&M machine — any of the 7 H&M models handling from 1½" to 36" pipe — after only a few minutes of instruction — and be assured of perfect cuts or bevels every time.

The split-horseshoe gear of H&M machines, plus their extreme lightweight, permits the operator to slip them easily over the next section of pipe and within a matter of minutes the cut or bevel is finished, accurate and true.

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Tulsa, was opened by Gardner, Robinson, Stierheim, & Weis, Inc., designers and builders of trade-show exhibits and displays. The folder points out that the plant has more than 6,500 sq. ft. of manufacturing area and complete facilities for on-the-spot fabrication and erection of exhibits and displays. These facilities practically eliminate packing case and transportation costs, according to the folder. **Write or call: Gardner, Robinson, Stierheim & Weis, Inc., 5875 Centre Avenue, Pittsburgh 6, for Exhibit & Display Plant folder.**

Revised 184-page floodlight catalog

. . . which gives descriptive and ordering information is now available. Information is easy to find. Divider sheets give individual tables of contents for each of 14 sections. The catalog discusses different types and purposes of floodlights, area-lighting problems, searchlights, accessories, and installation suggestions. **Write or call: Crouse-Hinds Co., Wolf & Seventh Streets, Syracuse 1, N. Y., for Floodlight Catalog 320.**

104-page antenna-systems catalog

. . . includes developments in 21-in. waveguide, high-power transmission lines, ground-to-air and telemetry antennas, microwave and two-way communication antennas, and two new sizes of Heliax (flexible coaxial line). The catalog includes a special 16-page section of general antenna-systems engineering information. **Write or call: Andrew Corp., 363 East 75th Street, Chicago 19, for Catalog 22.**

Desk-top analog computer

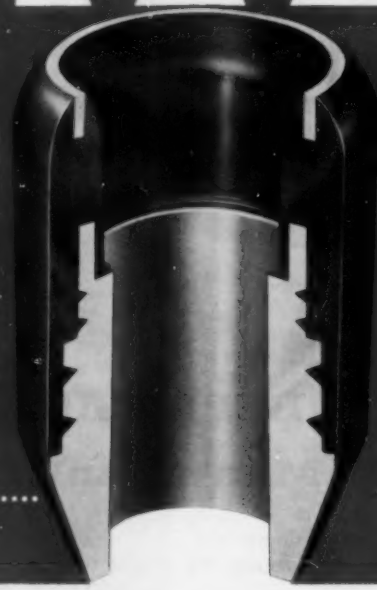
. . . which is versatile and economical in performing the functions of general-purpose analog equipment is detailed in new four-page Bulletin 340. The bulletin contains features of the computer, specifications, basic installation information, and photos. **Write or call: Donner Scientific Co., 888 Galindo Street, Concord, Calif., for Model 3400 Analog Computer bulletin.**

Oil-base emulsion-mud

. . . ingredient known as Invermul is outlined in a new four-page bulletin. Invermul stabilizes the emulsion, adds suspension properties, and aids reducing filtrations. The bulletin reviews Invermul's features, advantages, preparation, and limitations. A full-page summary is included. **Write or call: Baroid division of National Lead Co., P. O. Box 1675, Houston 1, for Invermul bulletin.**

NEW

MARK I CUP TYPE SWAB



Companion to the Proved E-Z Swab, the new Mark I Cup Swab uses the same mandrel but different rubbers. Mark I is a heavy duty positive displacement type swab able to lift a fluid load of from 1,200 feet to the heaviest loads encountered. Mark I was designed for use where the unique features of the E-Z Swab are not required. Heart of the Mark I—see cutaway—is a solid steel reinforcing core. This solid steel core can't wear, bend, and break as conventional reinforcing wires can. Can't hang up in tubing the way wires can. The new Mark I falls fast and comes out full. All this and the famous Mission Guarantee: "In a competitive test it will outperform all others or your money back." Order through your favorite supply store. Get your copy of the new brochure.

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REFERENCE GIVEN ON REQUEST

John B. Merritt elected

. . . president and chief executive officer of BJ Service, Inc., a Borg-Warner subsidiary. He has been executive vice president and general manager of BJ Service since 1951. He began his career within the Byron Jackson organization in 1941.

Continental-Emsco Co. names

. . . Max M. Marstrand to the position of division merchandise manager

M. M. Marstrand

Harry Hobbs, Jr.

with headquarters in Tulsa. Harry Hobbs, Jr., will fill the same position at the company's Houston division office. Dean P. Davis has been appointed used equipment representative. He will headquarter in Dallas and assist Guy Bigham, manager of used equipment department.

Fisher Research Laboratory, Inc., completes construction

. . . at its existing plant location in Palo Alto, Calif. Newly constructed are 4,000 sq. ft. providing for increased laboratory, administrative, and shipping requirements. The research and development facilities have been doubled in space.

Gordon R. Henderson elected

. . . president and director of Catalytic Construction of Canada, Ltd. He has been on the engineering staff of Shell Oil Co. of Canada. He was with Polymer Corp. as petroleum engineer and then chief engineer until 1951 when he was appointed general manager of Catalytic's Canadian activities. He was responsible for the formation of Catalytic in Canada.

Larkin Packer Co. opens

. . . a new warehouse in Edmonton, Alta. Larkin's warehousing and sales activities in Canada will be operated as a separate Canadian subsidiary, Larkin Products, Ltd. Representing the subsidiary as sales representatives in Canada are Lloyd Helmer in Calgary and Don Wilson in Edmonton.

Mid-Continent Supply Co. elects

. . . T. P. Tarwater as vice president, according to D. H. Thornbury, president. R. C. Holden has been promoted to assistant division manager of the Tulsa division. W. S. Jones has been boosted from assistant manager of the used equipment department to manager. Tarwater will have charge of Mid-Continent sales operations in West Texas, New Mexico, and the Rocky Mountain areas. He joined the company in 1936. Holden joined the company in 1948 and Jones in 1949.

T. P. Tarwater

R. C. Holden

W. S. Jones

Rodman Supply Co. appointed

. . . as a distributor for Jones & Laughlin Steel Corp.'s oil-country tubular products, according to E. A. Booth, J&L's tubular-products manager. Rodman, an Odessa, Tex., firm,

Layne & Bowler, Inc., board chairman discusses

. . . with new Layne executives the new Layne pump head design which was introduced at the Layne Associate Companies 24th annual meeting held in Memphis, Tenn., recently. Shown are T. H. Clark, Jr., sales manager; C. E. Ponkey, executive vice president; E. J. Rogers, board chairman; W. H. Reeves, president; and Ed Rudnicki, chief engineer.

has been a distributor of J&L's standard and line pipe. Four of Rodman's stores are in Texas at Andrews, Pampa, Odessa, and Crane, and one is in Hobbs, N. M. In addition, the firm has six sales offices located at Midland, Dallas, Houston, Fort Worth, Tulsa, and Oklahoma City.

C-B Southern, Inc., purchases

. . . 30 acres of land in Houston on which a manufacturing building of 30,000 sq. ft. and offices of 5,000 sq. ft. will be constructed. Additional manufacturing facilities are in the planning stages and will be announced later. Contractor is Triangle Construction Co. C-B Southern is a subsidiary of Cooper-Bessemer Corp.

Fischer & Porter Co. names

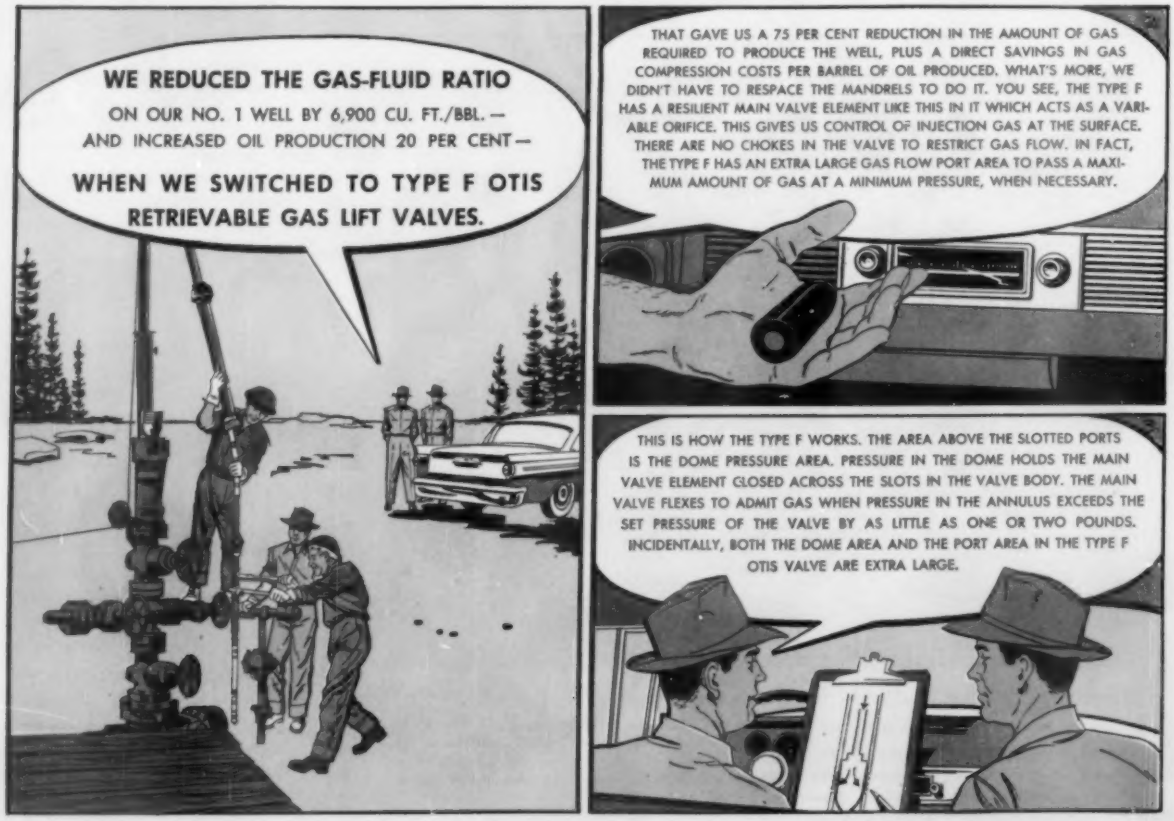
. . . George Bazaco as petrochemical industry manager, reporting directly to the vice president, sales. In this position he will coordinate all the company's marketing activities to the petroleum and chemical industries. He formerly was with M. W. Kellogg Co. and Hydrocarbon Research, Inc.

Welex, Inc., operations and sales departments complete

. . . a 2-week course in interpretation and analysis of resistivity and radioactivity logging, induction logging, and FoRxo logging. The school was held in Welex research and development laboratory in Houston. Students and instructors are, front row: B. M. Slater, operator; R. R. Lovely, shooter; D. D. Owens, logging trainee; J. Jordan, sales engineer; D. L. Wigley, sales engineer; and R. F. Smith, instructor. Second row: R. A. Coleman, instructor; M. D. Porterfield, sales engineer; R. L. Doyle, operations assistant; W. N. Edwards, engineer trainee; D. Gammill, sales engineer; O. B. Avent, operations manager; and W. O. Reynolds, sales engineer.

Flint Steel Corp. announces

. . . two appointments, according to Harold G. Lewis, president. W. P. Kissinger has been elected vice president and appointed director of sales. T. D. Weir has been appointed manager of sales of the structural and reinforcing division. Kissinger joined the company in 1951. Prior to that he was with Tulsa Equipment Co. and also Happy Co. Weir joined Flint Steel in 1948. He has formerly been with Patterson Steel Co. and also with Lytle & Grun Construction Co. in Alaska and Johnson-Winston & Kewitt Construction Co.


WE REDUCED THE GAS-FLUID RATIO
ON OUR NO. 1 WELL BY 6,900 CU. FT./BBL. —
AND INCREASED OIL PRODUCTION 20 PER CENT —
WHEN WE SWITCHED TO TYPE F OTIS
RETRIEVABLE GAS LIFT VALVES.
THAT GAVE US A 75 PER CENT REDUCTION IN THE AMOUNT OF GAS REQUIRED TO PRODUCE THE WELL, PLUS A DIRECT SAVINGS IN GAS COMPRESSION COSTS PER BARREL OF OIL PRODUCED. WHAT'S MORE, WE DIDN'T HAVE TO RESPACE THE MANDRELS TO DO IT. YOU SEE, THE TYPE F HAS A RESILIENT MAIN VALVE ELEMENT LIKE THIS IN IT WHICH ACTS AS A VARIABLE ORIFICE. THIS GIVES US CONTROL OF INJECTION GAS AT THE SURFACE. THERE ARE NO CHOKES IN THE VALVE TO RESTRICT GAS FLOW. IN FACT, THE TYPE F HAS AN EXTRA LARGE GAS FLOW PORT AREA TO PASS A MAXIMUM AMOUNT OF GAS AT A MINIMUM PRESSURE, WHEN NECESSARY.
THIS IS HOW THE TYPE F WORKS. THE AREA ABOVE THE SLOTTED PORTS IS THE DOME PRESSURE AREA. PRESSURE IN THE DOME HOLDS THE MAIN VALVE ELEMENT CLOSED ACROSS THE SLOTS IN THE VALVE BODY. THE MAIN VALVE FLEXES TO ADMIT GAS WHEN PRESSURE IN THE ANNULUS EXCEEDS THE SET PRESSURE OF THE VALVE BY AS LITTLE AS ONE OR TWO POUNDS. INCIDENTALLY, BOTH THE DOME AREA AND THE PORT AREA IN THE TYPE F OTIS VALVE ARE EXTRA LARGE.

W. L. Schweisberger promoted

W. L. Schweisberger

. . . to district manager of Eastman Oil Well Survey Co. in Lafayette, La., reports H. John Eastman, president. Schweisberger joined Eastman in 1950. He held positions as senior engineer and field supervisor in the Lafayette district prior to his promotion.

Woodfield Rochester Ltd. names

. . . E. L. Fuller as executive vice chairman. R. Keir Watson, formerly of Plessey Co., Ltd., has been appointed managing director.

W. R. Penland named

. . . as assistant southwestern division manager of Corrosion Rectifying Co. at Lafayette, La. He has been with Coreco since early 1957. He was formerly with Service Pipe Line Co. and Sohio Pipe Line Co. as corrosion engineer.

International visitors attend November meeting

. . . of Houston Chapter of Nomads. Standing are: J. C. Robbins, Iran Oil Co., Iran; Oscar Gonzales Ugaz, Impresa Fiscales de Peru, Peru; Jim Daive (rear), Iraq Petroleum Co., Iraq; John Hobson, Iraq Petroleum Co., Iraq; Mark Glover (rear), Cameron Iron Works, Venezuela; R. E. Bates, Baroid Division, Venezuela; John Fuller, Planet Exploration Co., Australia; P. W. Cooke, Magnet Cove Barium Corp., England; J. Rastagar, National Iranian Oil Co., Iran; R. Reyes, Hughes Tool Co., Mexico; Raydivaldo Ribeiro, Petrobras, Brazil; Orisan Almeida, Petrobras, Brazil; Carlos Alvez, Petrobras, Brazil; and Carlos Periera, Petrobras, Brazil.

Seated are: M. Hessabi, National Iranian Oil Co., Iran; B. Naderi, National Iranian Oil Co., Iran; J. Lahrrere, C.F.P.A., Algeria; Maurice Escole, C.F.P.A., Algeria; Padilha de Luz, Petrobras, Brazil; Helio Rosado, Petrobras, Brazil; Jean Frayssinet, Iraq Petroleum Co., Iraq; Fladio Lima, Petrobras, Brazil; and Bob Lingwood, Iraq Petroleum Co., Iraq.

Monsanto Chemical Co. appoints

. . . N. P. Hudson as assistant sales manager of protective coatings for Monsanto's Lion Oil Co. division at El Dorado, Ark. J. A. Keepers has been named to the new position of manager of petrochemical sales for Lion at El Dorado. G. L. Deniston has joined the engineering division at Miamisburg, Ohio. R. M. Kliss has

GAS ENTERS THROUGH THE PORTS, PASSES THROUGH A FINNED RETAINER, ACROSS THE RESILIENT CHECK VALVE (WHICH IS NORMALLY CLOSED), AND OUT THE BOTTOM OF THE VALVE. BECAUSE OF THE DESIGN, THE VALVES HAVE BUT ONE OPENING AND CLOSING PRESSURE — THAT'S THE PRE-SET PRESSURE.
ONE REASON TYPE F SERIES OTIS VALVES ARE SO EFFICIENT IS BECAUSE OF THE CHECK VALVE. AS I SAID, IT'S NORMALLY CLOSED — DOESN'T REQUIRE VELOCITY TO CLOSE; OPENS ONLY TO PASS THE SYSTEM GAS DURING INJECTION; GIVES A BUBBLE-TIGHT SEAL EVEN IN SAND-LADEN FLUIDS, AND ELIMINATES VALVE WASH-OUT.
THERE ARE MANY OTHER ADVANTAGES IN USING OTIS RETRIEVABLE GAS LIFT VALVES. THEY HAVE NO MOVING METAL PARTS, NO METAL BELLOWS TO FATIGUE, NO METAL-TO-METAL SEAL NOR STEM AND SEAT TO WEAR AND CUT OUT, AND YOU DON'T HAVE TO RETRIEVE OR MODIFY THE VALVES TO CHANGE FROM CONTINUOUS TO INTERMITTENT LIFT, OR VICE VERSA.
IF YOU HAVE M OR K SERIES ECCENTRIC SIDE-POCKET MANDRELS IN YOUR WELLS, AND YOU'RE LOOKING FOR WAYS TO IMPROVE THE EFFICIENCY OF YOUR GAS LIFT INSTALLATIONS, YOU SHOULD RUN TYPE F OR FK OTIS RETRIEVABLE GAS LIFT VALVES. YOU'LL GET BETTER CONTROL OF YOUR GAS — AT THE SURFACE, WHERE YOU WANT IT — WHICH CAN MEAN A LOWER LIFTING COST. GIVE YOUR WELLS A NEW LIFT — RUN OTIS GAS LIFT VALVES.
OTIS — "First in Gas Lift Control"
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joined the special projects department of the research and engineering division at the Everett, Mass., plant. D. E. George has joined the research department of the organic chemicals division at St. Louis. C. E. Youngren has joined the production and exploration department of Lion Oil at the district office in Calgary.

George Roberts appointed

George Roberts

. . . field manager of the Safe-T-Clad products division of Seamless Rubber Co., according to William H. Boylan, Safe-T-Clad division manager. Roberts, most recently, was with Polyken sales division of Kendall Co. In his present position he will headquarter at New Haven, Conn.

Thompson and Cordell elected

. . . to the board of directors and were named vice presidents of General American Transportation Corp., according to Sam Laud, chairman of the board. T. M. Thompson has been named vice president in charge of the tank car leasing division. J. N. Cordell is vice president in charge of the tank storage terminals division. Thompson joined the company in 1939 and Cordell in 1927.

Sectional steel barge delivered

. . . recently by Equitable Equipment Co., New Orleans, La., solved a problem for a United States oil firm operating in the Persian Gulf. Problems involved were overseas shipment and mobility. An 80-ft. barge could not be shipped aboard a steamer and lifting facilities at the port of destination could not unload such a barge. Cost of towing the barge from the United States to the Persian Gulf would have exceeded the original cost of the barge.

Then too, the buyer wanted the feature of portability so that, in the future, it could be moved over land by truck.

Equitable solved all these problems by constructing an 80-ft. barge, 35 ft. wide, and 7 ft. deep, in 6 watertight pontoon sections. Individual sections, three forward and three aft, can be bolted together to form a sturdy unit. An "A" frame derrick, a General Motors model 2031 diesel engine, and a Clyde three-drum, 30-ton hoist, added to the six sections, provide a barge of ample working capacity that was shipped by steamer.

White Motor Co. forms

. . . a new sales engineering department at its White Truck Division to be headed by William L. Peterson, reports H. D. Weller, Jr., vice president, sales. Assigned to the same department is V. C. Speece who will manage field engineering activities. This realignment of sales functions is planned to coordinate product and transportation engineering throughout the entire organization. Peterson has been director of sales promotion and advertising for the past year. Speece has been with White for 30 years in the engineering division.

W. L. Peterson

V. C. Speece

Hughes shifts W. L. Hunter

W. L. Hunter

. . . to special representative with headquarters in Oklahoma City. After serving the drilling industry for 45 years, the past 30 years with Hughes Tool Co., Hunter has requested less demanding responsibilities, according to W. H. Siems, general sales manager.

During the past 12 years Hunter has managed his company's northern region, which until recently extended from Oklahoma to and including all of Canada. He had served Hughes in many capacities, including district and division manager before being made regional manager.

Walter Curlee appointed

. . . administrative assistant to Arthur S. Marshall, vice president, sales, of H. C. Smith Oil Tool Co. For the past 2 years, Curlee has been chief industrial engineer for the company.

Walter Curlee

Engineering Supply Co. names

. . . Robert L. Brown manager of operations, announces G. W. Levering, Jr., president. Brown will assume direction of purchasing, inventories,

Each of these mixers weighs over four tons, yet they are so perfectly balanced they stand alone on their supporting blocks. Side support is not required. This means minimum stress on tank top flanged nozzles which support the mixers.

EXPANDED ESSO ALKYLATION UNIT TO USE

42 PHILADELPHIA MIXERS

Forty-two vertical Philadelphia Mixers like the ones shown are being installed at the Baton Rouge Refinery of Esso Standard Oil Company by Foster Wheeler Corporation. They are part of an alkylation process in which concentrated sulfuric acid serves as a catalyst to unite light olefins and isobutane to produce high octane gasoline blend stock. Installed in the various reaction zones of the reactors, they insure optimum contact of reactants.

These units are equipped with a shut-off device below the mechanical seal which permits seals to be changed with reactor vessels held at full pressure. This can be done simply and quickly, and requires *no external lifting equipment.*

For this, or any other fluid mixing job, Philadelphia Mixers offer many important design advantages.

- Extra large, heavy duty bearings throughout permit every drive component to be designed to required degree of stiffness. The strength and rigidity of drive assemblies keep gearing effectively isolated from unbalanced output shaft loads which might cause damage.
- Extremely heavy output shafting keeps shaft deflection to an absolute minimum, even under heavy unbalanced mixing loads.
- Extra long output shaft bearing span insures precision shaft operation and minimum runout in the seal area.
- All gearing is induction hardened and ground or crown shaved for long, quiet, trouble free life.
- Quick change gear sets are available from stock to furnish 14 standard AGMA output speeds.

To select the exact mixer for your process needs, write for Catalog A-27. It contains all the information needed to make a catalog selection of a complete mixer assembly.

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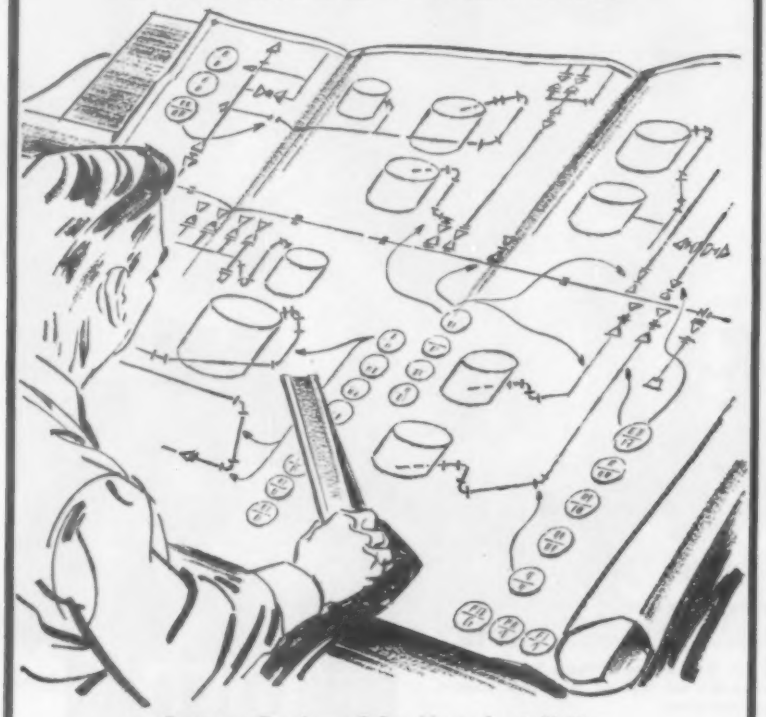

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The most effective means for the extinguishment of these large flammable liquid risks is foam, if applied properly and at the required rate of application. For this reason the designing of a modern foam system must be done by such experts.

American LaFrance will design the complete system for you, including specifications of material, sizing of pipes, and provide a complete layout of your risk. This service is available at no cost or obligation.

American LaFrance's "Foamite" has become synonymous with fire extinguishment of petroleum fires around the world. We are proud of this association and will continue to bring you the latest developments in Foamite fire protection.

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warehousing, and deliveries in Dallas. He has previously served with General Electric Co.

Charles C. Snider appointed

C. C. Snider

. . . as director of sales, Consolidated Electrodynamics Corp., reports Robert L. Smallman, marketing vice president. Snider, CEC sales manager for the past 3 years, succeeds W. F. Johnson. In his new position, Snider heads a national network of company-owned sales and service centers in 18 principal cities. He joined CEC in 1952.

Lou D. Cochran joins

. . . Rector Well Equipment Co., Inc., as sales and service engineer, according to J. L. Pinkard, sales manager. Cochran will work in the Odessa, Tex., area. He formerly has been with National Supply Co. and Gulf Coast Machine & Supply Co.

R. E. Drane joins sales staff

. . . of Enardo Manufacturing Co., Tulsa. He will work out of the company's headquarters, Frank P. DeLarzelere, sales manager, reports. Drane formerly was a sales engineer for Black, Sivalls & Bryson, Inc.

A.P.I. tech school men view

. . . this lapping machine used in the manufacture of balls for oil well pump check valves during a plant tour of Harbison-Fischer Mfg. Co. in Fort Worth. They are on a field trip as part of a course in petroleum technology sponsored by the American Petroleum Institute, University of Texas, and Kilgore (Tex.) College. Pictured are: L. B. Harbison, sales manager of the pump firm; H. G. Fisk, Honolulu Oil Corp., Robert Preston, Caltex Petroleum Co.; Pete Schoe, Shell, Venezuela; and Floy Smith, operator of the machine.

A large diameter steel head takes form on one of Claymont's spinning machines—units that turn out heads up to 19 feet in diameter, in ferrous and non-ferrous metals. Integrated facilities make Claymont a reliable source of quality steel plate and plate products for industry

by d'Arazien

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New type DRILLING PLATFORM

. . . GOES "ON LOCATION" FOR ARAMCO

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The new LeTourneau mobile platform, "Aramco Mobile Drilling Platform No. 1," introduces another money-saving advancement to the offshore drilling industry. This self-elevating platform, used with Aramco's tender "Queen Mary," can be moved quickly from location to location . . . saving the time and cost of building a permanent structure each time.

The Aramco platform was built at our Vicksburg, Mississippi plant and towed to the Persian Gulf. Another LeTourneau tender-assisted platform, built for another company, will soon be operating in the Persian Gulf. While similar in design to the larger self-contained LeTourneau mobile platforms, these tender-assisted units carry a minimum of equipment other than derrick and drawworks. The remainder of the equipment needed for drilling is carried aboard the tender.

In offshore operations around the world, big self-contained and smaller tender-assisted LeTourneau mobile platforms are building a reputation for efficient performance at lower operating costs. Each platform is built to meet specific requirements of the operating company. For detailed information, without obligation, send in the coupon below.

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M115

EXPLORATION SPOTLIGHTS today are trained on a drilling campaign west of the Colorado River in southeastern Utah. The discovery of 110 ft. of biohermal reef at Poison Springs, plus excellent showings of oil, indicates a potential new oil province for the state.

Paradox basin gets first true reef

BY FRANK J. GARDNER

GEOLOGISTS take a lot of kidding about their optimism. But it's doubtful you'll ever find a geopessimist on the staff of any successful oil outfit. To the geologist, no hole is ever completely dry. Even if it's abandoned, he learns a lot about the subsurface in that particular location. And often, that learning leads to success in the next hole.

A lonely wildcat . . . Today, we have such a situation unfolding on the west flank of the Paradox basin of southeastern Utah. Tennessee Gas Transmission Co., at its 1 USA Poison Springs (Section 4-31s-12e, Garfield County) has reached the final testing stages in what is probably the most important Rocky Mountain wildcat of the year. TGT isn't yet sure it has a dry hole, but it's prepared for the worst.

Disappointment over the commercial aspects of the wildcat is heavily offset by what the hole has revealed. And if the well is abandoned, it may be that a dry hole will once again point an expensive finger at a profitable new oil province.

Finds three phenomena . . . Just what have we learned? At least three vitally important things.

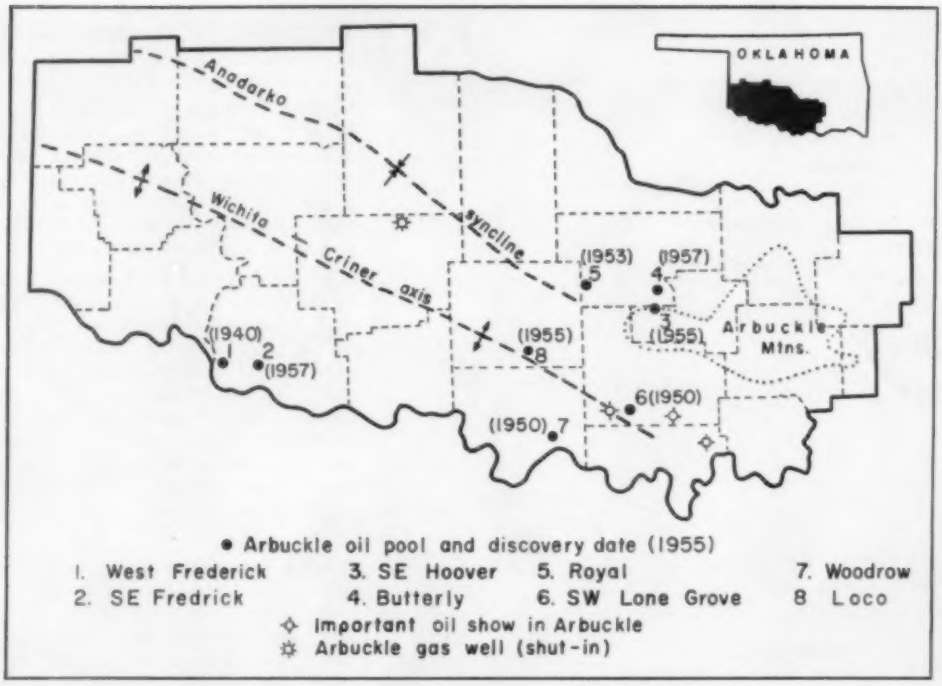
- **First,** there's a matter of lithology. The Poison Springs test found the Hermosa-Paradox section, topped at 4,142 ft., to be predominantly sand, as contrasted to the limestone in the Aneth region on the southeastern part of the basin.
- **Second,** the presence of free oil in these Hermosa sands was proved in a drill-stem test at 4,164-94 ft., and other Pennsylvanian shows were found at 4,310-4,676 ft.
- **Third,** the bit cut 110 ft. of biohermal Pennsylvanian reef at 4,900-5,100 ft., with oil staining in the top 70 ft. Cores of the entire reef section revealed good porosity and permeability throughout. Production tests of the section yielded both oil and water. The well was taken to the Devonian at total depth 6,486 ft.

So wet or dry, Poison Springs may be the forerunner of a major oil strike west of the Colorado River. This is the first indication of reefing in this part of the country, and the first trace of commercial oil. TGT's oil finders are not going overboard in their estimation of the prospect, but there's a gleam in their eyes, and they've been heard to use the words "Scurry-type reef" out loud.

After a thorough study . . . Before drilling this prospect, TGT dug up every scrap of evidence, every available log (and they were few), and conducted an extensive seismic program. The sparse geological controls hinted at the presence of traps. The seismic work revealed an anomalous condition. Everything needed for an oil field was there . . . except the oil. But there was reason to believe that it, too, might be there. A well drilled by Paradox Production Co. in 1957 had recorded good oil showings in the Pennsylvanian sands; this was in Section 34-30s-13e, Wayne County, about 6 miles east-northeast of Poison Springs (see map). So TGT decided to give it a try.

Believing it is too low on structure, the company has moved 7 miles north to drill the 1-A USA-Sorrel Butte in Section 33-29s-12e, Wayne County. This one, on the same anomaly as the Poison Springs, could easily be the trigger well for a real reef strike. It is drilling below 3,600 ft. now, and has already found bleeding oil cores in dolomite at 2,064-84 ft. and heavily oil-stained sand cores at 2,162-96 ft. A drill-stem test in what is believed to be Sinbad-Triassic sand at 2,151-96 ft. recovered 390 ft. of heavily oil-and-gas cut mud.

And one out of nine should hit . . . TGT isn't alone in this drilling arena. Others with active wildcats west of the Colorado include Superior Oil Co., Continental Oil Co., Pan American Petroleum Corp., Carter Oil Co., Shell Oil Co., and Amerada Petroleum Corp. Nine wildcats, in addition to Poison Springs, are whirling away. If the national average for wildcat success holds good, at least one of these is bound to hit. So place your bets.

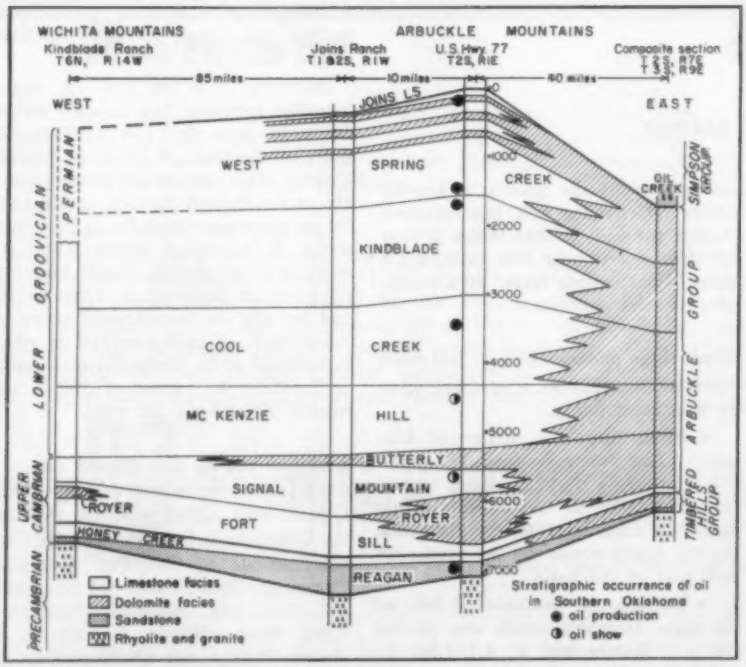


THE Arbuckle limestone in southern Oklahoma is a particularly attractive drilling target, and potential of these rocks has barely been scratched.

Southern Oklahoma:

Golden province for oil finders

BY WILLIAM E. HAM
Geologist, Oklahoma Geological Survey



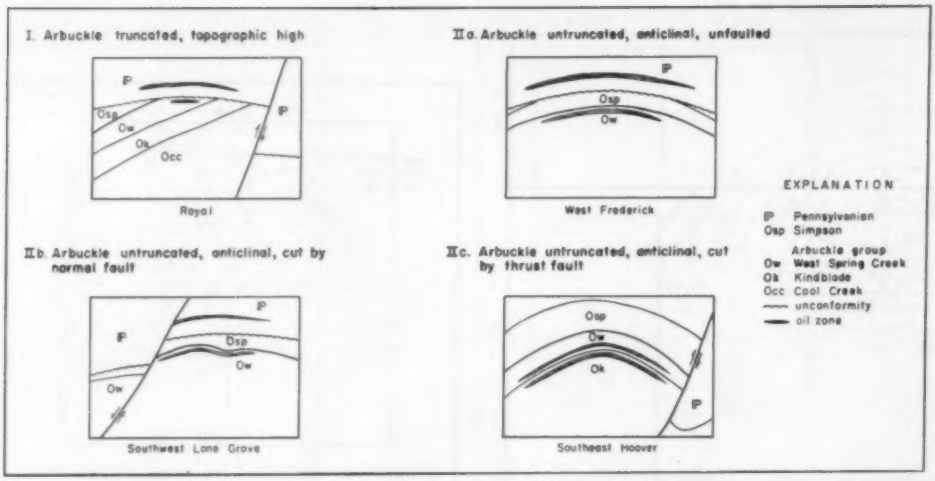
OIL HAS BEEN FOUND in nearly all the formations of the Arbuckle group. Here is the classification and regional facies of the pre-Simpson strata in the Arbuckle and Wichita mountains.

SOUTHERN OKLAHOMA is a geologically complex and peculiarly oil-rich province that covers approximately 13,500 sq. miles between Red River on the south, Anadarko basin on the north, and the Ouachita Mountains on the east. The province is about 225 miles long and 60 miles wide.

Yet this relatively small area (1) contains two major uplifts—Arbuckle and Wichita mountains—with a section of Paleozoic rocks nearly 30,000 ft. thick; (2) it consistently yields 80 to 100 million barrels of oil per year from about 300 named pay sands of Permian, Pennsylvanian, Mississippian, Devonian, Silurian, and Ordovician age; and (3) it locally has more unconformities, faults, and stratigraphic pinchouts per square mile than any other part of Oklahoma.

Oil is produced commercially at depths ranging from 500 to 15,500 ft. And the search for oil is so intense that three wells each have drilled 4,000 to 11,000 ft. of igneous rocks in unsuccessful attempts to penetrate thrust faults and to find thereunder new pools and productive traps.

Publication authorized by the director, Oklahoma Geological Survey.



OIL production from Arbuckle rocks comes from a variety of structural and stratigraphic conditions.

Near the base of the stratigraphic succession is the Arbuckle group of limestones and dolomites, Lower Ordovician and Upper Cambrian in age. Its maximum thickness is 6,700 ft. The Arbuckle limestone is one of outstanding examples of uninterruptedly thick carbonate rocks in all the Paleozoic rocks of the world; and in southern Oklahoma, until 18 years ago, it was regarded by geologists and wildcatters alike to be as dry as it is thick.

Despite prolific production of oil from the Arbuckle in northern Oklahoma and Kansas, and from the partly equivalent Ellenburger group in Texas, no oil was produced from Arbuckle rocks in southern Oklahoma until 1940.

The original discovery in 1940, West Frederick in Tillman County, has produced 1.39 million barrels of oil from uppermost Arbuckle strata to January 1, 1958. This discovery caused little excitement, and only three new pools, mostly small, were found through 1953. In 1955 a major Arbuckle discovery was made at Southeast Hoover, a steeply folded anticline at the northwest edge of the Arbuckle Mountains, and a renewed search for Arbuckle oil began.

Another small discovery was made in 1955 and two were made in 1957, and there are now eight Arbuckle pools in southern Oklahoma—West Frederick, Southeast Frederick, Southeast Hoover, Butterly, Royal, Southwest Lone Grove, Loco, and Woodrow.

Cambrian oil . . . Within the 1940-1957 period of Arbuckle exploration, oil was found under the Arbuckle group in the Reagan sandstone. Jones Oil Co. 9 Furst, NE SE NW 16-1s-8w, Stephens County, was completed in May 1952 at a depth of 8,500-62 ft., pumping 30 bbl. of 32°-gravity oil per day. Although this well is now abandoned, it is highly significant in showing the occurrence of petroleum in Reagan sandstone where it lies conformably under Honey Creek and Arbuckle limestones.

The Furst well, along with West Frederick, Southeast Frederick, and probably Southeast Hoover, shows with reasonable assurance that oil is indigenous in a column of Lower Ordovician and Upper Cambrian rocks as much as 7,000 ft. thick. In terms of oil-recovery potential, this conclusion has major importance for much of southern Oklahoma.

Stratigraphy and Lithology

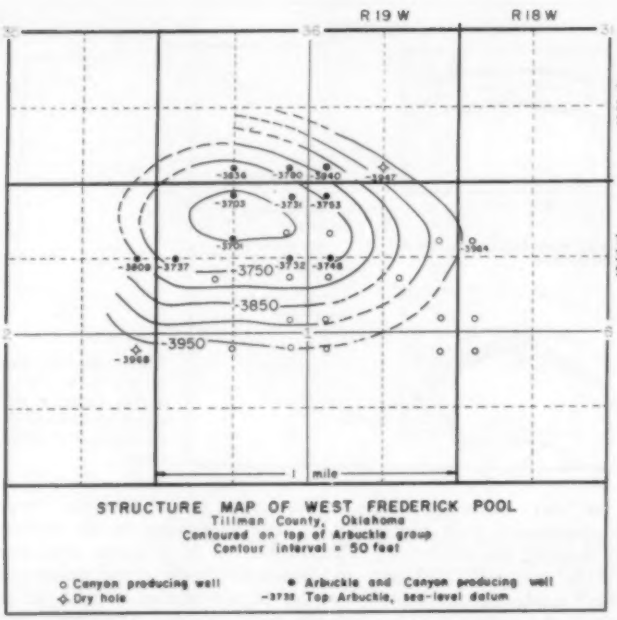
The primary basis for subdivision consists of the six limestone formations that are well exposed in the western part of the Arbuckle Mountains and partly exposed in the Wichita Mountains. The upper four formations—West Spring Creek, Kindblade, Cool Creek, and McKenzie Hill—are assigned a Lower Ordovician age. They have a maximum aggregate thickness of 5,200 ft.; each formation is normally 1,000 to 1,400 ft. thick. The lower two limestones—Signal Mountain and Fort Sill—are assigned to the Upper Cambrian, and they have a combined maximum thickness of 1,350 ft. The Fort Sill limestone at the base of the Arbuckle is normally 600 ft. thick; the Signal Mountain limestone ranges between about 350 and 750 ft. in thickness.

Dolomite common . . . In the northern and eastern parts of the Arbuckle Mountains most of the Arbuckle group consists of dolomite facies, partly in the form of westward-projecting tongues. Two of the prominent dolomite tongues are so extensive that formation names have been given to them. The Butterly tongue is everywhere present in the Arbuckle Mountains, but is lacking in the Wichita Mountains. It is a facies equivalent of limestones both in the upper part of the Signal Mountain and in the lower part of the McKenzie Hill. The unfossiliferous dolomite beds of the Butterly, 150 to 300 ft. thick, thus straddle the Cambrian-Ordovician boundary and make difficult the establishment of a satisfactory systemic division.

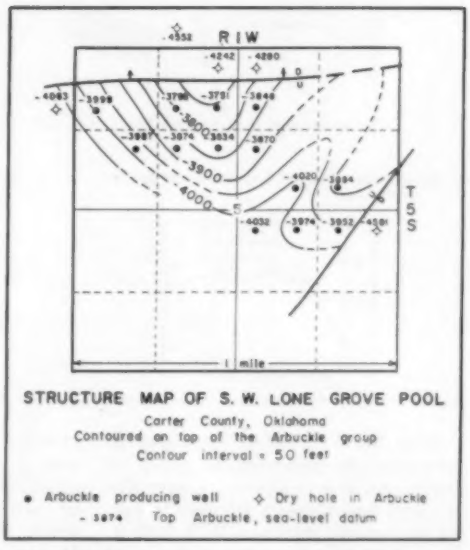
The second-named dolomite tongue is the Royer. It has a maximum thickness of 735 ft., and is equivalent in its thickest section to most of the Fort Sill and the lower part of the Signal Mountain. The Royer disappears at the western edge of the Arbuckle Mountains and reappears in the Wichita Mountains as a local lens 200 ft. thick.

In many subsurface areas of southern Oklahoma, as well as in the northeastern parts of the Arbuckle Mountains, most of the Arbuckle group is composed of dolomite. Through the use of gross lithologic and insoluble residue criteria it is possible to identify the dolomites in terms of the limestone facies, and to name them accordingly. Fossils assist considerably in the determination, but in most well samples, particularly of dolomites, fossils are rare or lacking.

Approximately a dozen types of limestones and dolomites, and mixtures thereof, occur in the Arbuckle group. Without notable exception these types reoccur both stratigraphically and as local facies, so that no lithology characterizes a single formation. Conversely, nearly all lithologic types can be expected from top to bottom of the group. The limestones are built from the following main components: (a) algal colonies and beds, and their fragmental remains, (b) pellets, (c) oolites, (d) lime muds, (e) sand grains, locally



WEST FREDERICK is a simple unfaulted anticline with 200 ft. of closure. The 11 wells in the pool have produced 1.37 million barrels of oil.



SOUTHWEST LONE GROVE is a fault closure bounded by normal faults. Here the Arbuckle is overlain by Simpson rocks.

concentrated in the form of beds, (f) chert, mostly occurring as diagenetically replaced nodules, and (g) calcite cement.

Dolomite enters into the limestone fabric by replacement or by mixing of limestone and dolomite grains mechanically swept together on the sea floor. All gradations of dolomite and limestone are known. Dolomite rock occurs as mottled patches, as laminae, as beds a few feet thick, as major units embracing the thickness of the entire Arbuckle group, and as lenses of extremely irregular outline that are related to faults and fractures. In texture the dolomite ranges from microgranular to coarsely crystalline.

On the basis of field and texural evidence it is believed that dolomites of the Arbuckle group were formed (a) syngenetically on the sea floor in Cambrian and Ordovician time; (b) diagenetically, by the slow action of connate waters on consolidated limestones; and (c) epigenetically, as fault-controlled replacement masses during Pennsylvanian time. As all the Arbuckle oil thus far produced in southern Oklahoma has come from dolomite or from dolomite beds interstratified with limestone, it follows that a thorough knowledge of these rocks is needed for a comprehensive understanding of Arbuckle petroleum geology.

Oil in the Arbuckle Group

By 1958 oil had been produced in southern Oklahoma from beds at the top of the Arbuckle group, at several horizons within it, and from the Reagan sandstone below it. Most production has come from limestones and dolomites of the West Spring Creek and Kindblade formations, in the upper 2,000 ft. of the group. This production has been found mostly in pools where structural control has furnished the trap and where Simpson strata overlie the Arbuckle. Under the same structural control, important oil shows have been found in the McKenzie Hill and Signal Mountain limestones, respectively, 4,500 and 5,500 ft. stratigraphically below the top of the Arbuckle group. Beneath unconformities, beds eroded as much as 3,000 ft. below the top have been productive.

Production depths have ranged from 2,000 to 7,500 ft., and oil gravity ranges between 28° and 39°. There is no consistent relation of gravity to depth, as the common average is 32°-35° both at 2,000 ft. and 4,800 ft. Deepest production at 7,500 ft. in Southeast Hoover has the relatively high gravity of 38°.

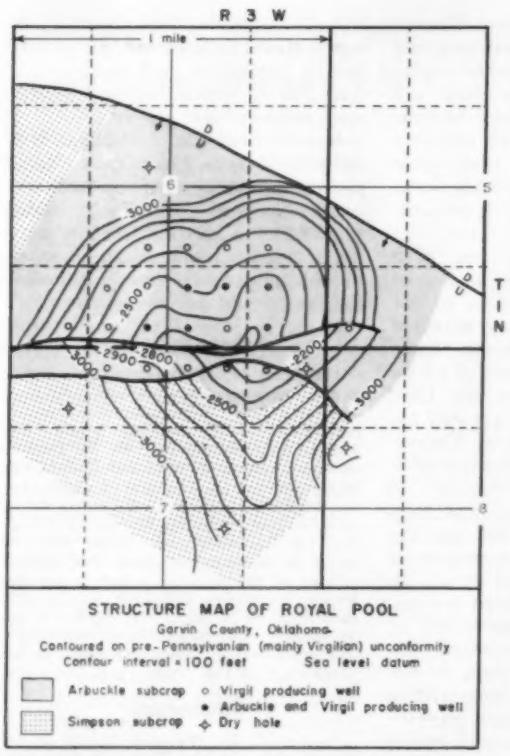
Porosity zones are in fine-grained limestones and microgranular to fine-crystalline dolomites, together with thin sandstones and sandy dolomites of rare occurrence. These zones are 2 ft. to more than 400 ft. thick, and they occur at or well below the top of the Arbuckle group. Open-flow potentials on the best wells are as high as 1,000 to 2,400 bbl. of oil per day, and many wells have a potential of 100 to 300 bbl. oil per day. A general summary of Arbuckle production in southern Oklahoma is given in Table 1.

Structural and Stratigraphic Control

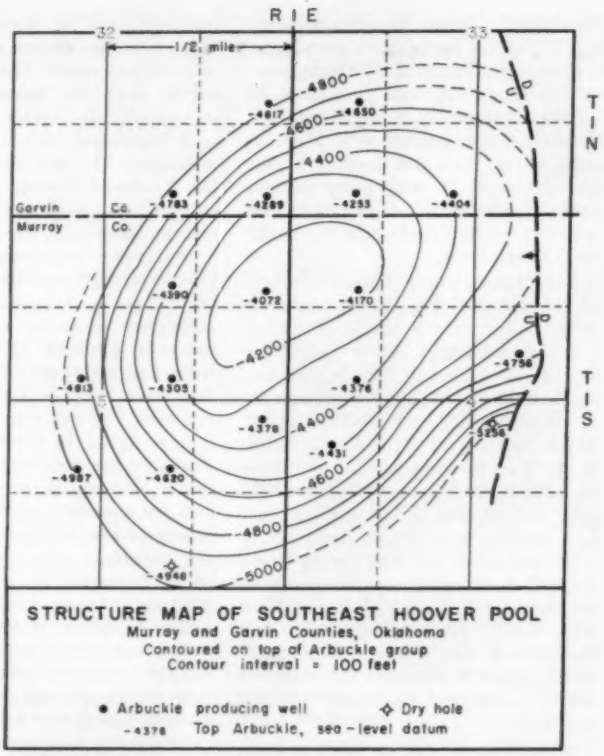
From a study of the eight pools from which Arbuckle oil has been produced, it is clear that oil in the Arbuckle group occurs in much the same manner as it does in sandstones of the Simpson group, sandstones of Pennsylvanian age, or limestones such as the Viola, Hunton, and Sycamore. An indigenous origin is proposed for at least part of the Arbuckle oil and can be demonstrated in some pools. In other pools there is an element of doubt because faulting or unconformities may have provided channelways for the migration of oil into Arbuckle rocks.

The study also shows that a simple classification of structural traps can be established.

Traps of Class I . . . The simplest type of trap is here called Class I. It consists of pools in which various stratigraphic units of the Arbuckle are present as topographic highs beneath unconformities. In southern Oklahoma the unconformity overlying strata are mostly of Pennsylvanian (Hoxbar and Deese) age. Woodrow, Royal, and Loco pools exemplify this type. In each of these pools, oil in the Arbuckle is associated with weathered zones at unconformities, and porosity induced weathering on buried hills governs the



ROYAL POOL produces from a buried Arbuckle hill and production is confined to the top 200 ft. of the subcrop.



UNDOUBTEDLY the most significant Arbuckle production in southern Oklahoma occurs at Southeast Hoover where a closely folded Arbuckle anticline controls production.

accumulation of oil more than anticlinal folding or lithology of the Arbuckle. Away from the tops of the hills, Arbuckle wells encounter salt water.

At Royal pool the buried Arbuckle hill is 700 ft. high, and Arbuckle wells produce from the top 200 ft. of the hill. A thrust fault bounds the pool on the north and normal faults cut it on the south. Woodrow pool likewise is cut by a normal fault, and as a result the oil in both these pools may be interpreted as nonindigenous.

In the Loco district of Stephens County, Arbuckle production has been found on a buried hill in two wells under a detrital zone of Hoxbar age. W. B. Cleary 2 Jackson, NW SW SE 25-2s-6w, had initial production of 360 bbl. of 35°-gravity oil per day from a 2-ft. zone 30 ft. below eroded top of the Arbuckle. Pay zone as shown by a core is brecciated and fractured microgranular dolomite, the fragments of which are cemented by coarsely crystallized dolomite. The brecciation is of tectonic origin and doubtless is pre-Hoxbar in age, but oil accumulation in this zone probably is related to the unconformity.

Traps of Class II . . . In pools of Class II, Simpson beds overlie the Arbuckle group, and anticlinal folding governs the accumulation of oil. Most of the Arbuckle oil thus far produced in southern Oklahoma has come from the five pools of this class—West Frederick, Southeast Frederick, Butterly, Southwest Lone Grove, and Southeast Hoover. Productive traps of this group are divided into three subclasses.

Pools of Class IIa are simple unfaulted anticlines. West Frederick and Southeast Frederick are the known examples. Closure on top of the Arbuckle at West Frederick is about 300 ft., and production is obtained from fine-grained dolomites at the very top of the West Spring Creek formation. This pool is the first Arbuckle discovery in southern Oklahoma, and from March 1940 to January 1, 1958, it had produced 1.39 million barrels of oil from 11 wells. At Southeast Frederick the productive horizon is 10 ft. of microgranular dolomite 140 ft. below the top. Unproductive limestones and shales of the Simpson group overlie the oil pays in the upper part of the Arbuckle in each pool.

The strongest evidence for the indigenous origin of Arbuckle oil is shown by these two pools, as there is no probability that the oil has been introduced through the Simpson from overlying Pennsylvanian rocks, and there is no known fault along which oil might have migrated from other source beds.

Class IIb pools, anticlinal folds cut by normal faults, are illustrated by Southwest Lone Grove and Butterly. In each of them production is found in the upper part of the West Spring Creek formation, in porous dolomite-sandstone or dolomite-limestone zones 3 to 20 ft. below the top. Simpson beds cover the West Spring Creek, and each pool is cut by a normal fault of 500 to 900-ft. displacement. As a result, Simpson or Pennsylvanian beds are in contact with the Arbuckle pay zone on opposite sides of the faults, and these beds may have introduced oil into the Arbuckle. At Butterly there is a striking difference in oil gravity, however, for production from the lower Simpson Oil Creek sand is 13° whereas that from the underlying West Spring Creek is 35°. It is not clear whether this difference is the result of fractionation of oil from a common source, which might well be Arbuckle, or whether two different sources are involved.

Significant oil field . . . The major Arbuckle discovery in southern Oklahoma is Southeast Hoover, which so far is the only known representative of Class IIc, a closely folded anticline of Arbuckle rocks overlain by Simpson and cut by a thrust fault. From its discovery in November 1955 by the Frankfort Oil Co. 10 Baldwin,

NE NE SE 5-1s-1e, through September 1958, 23 wells have produced 1.08 million barrels of oil from interbedded limestones and dolomites in the West Spring Creek and Kindblade formations. The structure is a northeast-trending anticline having a closure of 1,000 ft. and a dip on the flanks of about 20°. It is cut on the east and probably also on the north by a thrust fault.

The discovery well flowed 474 bbl. of oil per day from a porous zone in the lower part of the West Spring Creek formation, 1,178 ft. below the top of the Arbuckle. The highest initial potential was found in Frankfort 11 Baldwin, SE NW NW 4-1s-1e, which had top of Arbuckle at 5,160 ft. It was perforated with 40 shots at 5,220-6,390 ft., acidized with 8,000 gal., and flowed 1,320 bbl. oil per day through 1-in. choke from nearly a full section of the West Spring Creek formation. It was also perforated with 40 shots at 6,430-6,720 ft., acidized with 6,000 gal., and flowed 1,080 bbl. oil per day through 1-in. choke in the upper Kindblade. The well was dually completed for 2,400 bbl. oil per day.

Frankfort Oil Co. 13 Baldwin Unit, SE NW NE 5-1s-1e, is more typical of wells in the pool. It was dually completed for 638 bbl. oil per day, flowing 288 bbl. from intervals at 5,414-5,727 ft. in the lower West Spring Creek, and flowing 350 bbl. from intervals at 6,612-6,770 ft. in the upper Kindblade. These two porous zones have a productive gross thickness of about 400 ft.

The occurrence of oil deep within the Arbuckle at Southeast Hoover has posed questions about the origin of both the oil and the dolomite reservoir beds. Is the oil indigenous? Is the dolomite of the pay zones a normal stratigraphic part of the Arbuckle, or is it introduced along faults and therefore of tectonic origin? The relations are not so clearly shown that decisive answers can be given. Without the bounding thrust fault it would appear that the oil is indigenous, just as it is at West Frederick and Southeast Frederick. The asphaltic residues in sands of the overlying Simpson group may have been derived from oil in the Arbuckle, rather than all the oil having been introduced across a fault from outside sources. The thin dolomite beds interstratified with limestone are normally expectable in the limestone facies of all Arbuckle formations, and accordingly they would not seem to be controlled here by faults.

Unfortunately there are no criteria by which tectonic dolomite can be infallibly recognized, other than by field relations, and at Southeast Hoover these relations cannot be determined in sufficient detail. The writer's opinion is that the dolomite beds are stratigraphically rather than tectonically controlled, that the oil probably is indigenous, and that other pools like Southeast Hoover probably occur in southern Oklahoma, with or without accompanying thrust faults.

Discovery expectancy has been greatly strengthened by the finding of oil and gas in Arbuckle rocks at four additional wells in widely scattered parts of southern Oklahoma. Three wells had impressive shows of oil on drill-stem tests in Carter and Love counties, and one shut-in gas well has been found in Comanche County. Probably the best incentive for additional drilling is the discovery, in two wildcat wells, of free oil in limestones of the McKenzie Hill and Signal Mountain formations, deep within the Arbuckle. In one of these wells a strong oil show was found in Cambrian Arbuckle limestone, 3,325 ft. below salt water in Ordovician Arbuckle limestone. This show is further encouragement for deep drilling to beds low in the Arbuckle group.

Following is a summary of critical information on the four wells:

Tidewater Associated Oil Co. 1 Myers, NE NE NW 10-4n-11w, Comanche County, completed as a shut-in gas well April 1951; top Arbuckle under Simpson 3,478 ft.; DST 3,734-3,963 ft. in alternating limestone and dolomite of the upper West Spring Creek formation, flow 1.67 M.M.c.f.d. of gas through 1¾-in. choke after acidization. Porous zone is 229 ft. thick, 225 ft. below top Arbuckle.

Frankfort Oil Co. 2 Williams, SE NW NE 12-5s-2w, Carter County, completed June 1955; DA; DST 12,390-12,435 ft. in McKenzie Hill limestone, gas to surface in 1 hour 15 minutes, recover 2,100 ft. of oil-cut water load and 4,938 ft. of green oil.

Seaboard Oil Co. 1 Sutton, SE NE SW 21-5s-1e, Carter County, completed October 1955; DA; DST 4,125-54 ft., salt water in McKenzie Hill (?) limestone; DST 7,450-85 in Signal Mountain limestone, gas to surface in 5 minutes, in 2 hours recovered 510 ft. heavily oil and gas-cut mud, estimated 40° gravity.

Frankfort Oil Co. 1 Gardner, SW NE NW 34-6s-2e, Love County, completed April 1956; DA; top Arbuckle under Simpson 11,660 ft.; DST 11,662-11,914, recover 8,192 ft. gassy oil; acidized, recovered load, swabbed 43 bbl. oil per day, then lost circulation and could not complete.

Acknowledgments

The writer expresses grateful appreciation to the following companies and individuals who have freely given information on oil occurrences in the Arbuckle group: The Texas Co., Shell Oil Co., W. M. Decker, of Cities Service Oil Co., and E. F. Culp, of Continental Oil Co. Special thanks are due Myron E. McKinley, of Pasotex Petroleum Co., and John H. Warren, of Frankfort Oil Co. Both men worked with the writer in the early stages of field investigations of the Arbuckle group in the Arbuckle Mountains, and later applied this knowledge to a search for Arbuckle oil in southern Oklahoma. Their information and opinions have aided materially in the preparation of this paper.

Bibliography

Decker, C. E., "Progress Report on the Classification of the Timbered Hills and Arbuckle Groups of Rocks, Arbuckle and Wichita Mountains, Oklahoma," Oklahoma Geological Survey, Circular 22, 1939, p. 62.

Caswell, C. A., "Arbuckle Region Offers Good Possibilities," The Oil and Gas Journal, Vol. 55, No. 29, July 22, 1957, pp. 158-161. Discussion of area that includes Southeast Hoover pool.

Ham, W. E., "Field Conference on Geology of the Arbuckle Mountain Region," Oklahoma Geological Survey, Guide Book III, 1955, p. 61.

"Origin of Dolomite in the Arbuckle Group, Arbuckle Mountains, Oklahoma," Proceedings, Fourth Symposium on Subsurface Geology, University of Oklahoma, 1955, pp. 67-73.

McBee, William, Jr., and Vaughan, L. G., "Oil Fields of the Central Muenster-Waurika Arch, Jefferson County, Oklahoma, and Montague County, Texas," Petroleum Geology of Southern Oklahoma (AAPG), 1956, pp. 355-372. Discussion of Woodrow pool.

Westheimer, J. M., and Schweers, F. P., "Southwest Lone Grove Field, Carter County, Oklahoma," Petroleum Geology of Southern Oklahoma (AAPG), 1956, pp. 144-153.

Knox field adds another deep well

SOUTHERN OKLAHOMA'S deep Knox field play is back in the headlines. British-American Oil Producing Co. reports that the 1 Bell in SE SE NW SW 7-3n-5w, Grady County, flowed gas-condensate on drill-stem test of the Third Bromide Ordovician sand.

The test was at 15,657-15,807 ft. On ¼-in. choke the well flowed 4,300 M.c.f.d. of gas and 177 bbl. condensate per million. On ⅞-in. choke it made 2,800 M.c.f.d. with 165 bbl. condensate per million.

The deepest producer in this field (and in the state) is British American's 1 Krieger at 16,546 ft. in the Oil Creek sand. That well is located in C SW SW 3-2n-5w on the Stephens County side of the play. Depth of the deepest well on the Grady County side is 16,036 ft. in the Second Bromide sand (the 1 Harrison-B, C W½ NE 28-3n-5w).

California's Mojave will soon taste driller's bit

A SIX-MAN Sunray Mid-Continent Oil Co. exploratory crew has moved into California's Mojave Desert to test sedimentary deposits in the vast and bleak expanses of this comparatively unexplored plateau.

F. W. Borden, vice president of California operations, said Sunray has leased some 25,000 acres in the Mojave and is working on arrangements to conduct core-drilling operations on an additional 50,000 acres.

Two-point aim . . . The company's search in the desert embraces a two-fold objective: The discovery of common minerals in commercial quantities, and the discovery of rare minerals which may have future commercial potential.

Sunray geologists believe that additional commercial deposits of evaporites and salines will be found in the Mojave Desert.

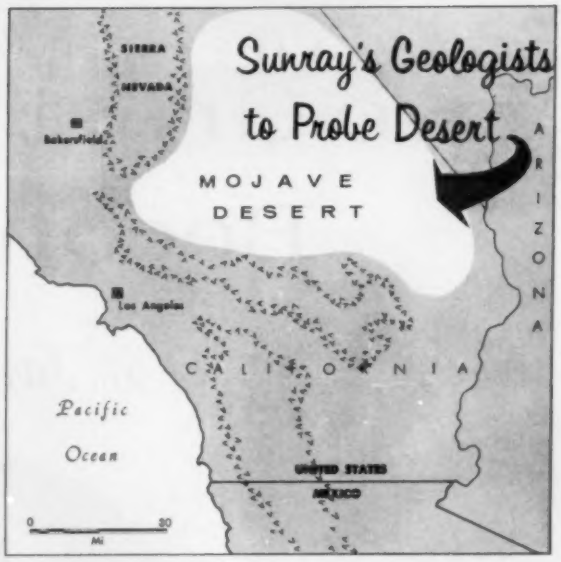
Such minerals might include beryllium, kyanite, lithia minerals, special types of clays, and such minerals as bastnaesite, monazite, and xenotine. These latter "solid minerals" contain elements such as cerium, which is used in electronics, and lanthanum, didymium, and thorium, which are used in the atomic-reactor field.

Saline minerals might include trona, hanksite, potassium chloride, and borax, from which boron is produced. Boron received prominence recently as a new power component in gasoline and as a fuel constituent for jet planes and rockets. Sunray officials emphasized, however, that the Mojave program is not restricted to exploration for any particular mineral.

Winter work . . . Geophysical and core-drilling activities began in May 1958 but work was halted in July when extreme desert temperatures set in. Work was resumed in October and is expected to continue through February.

. . . Four methods. Sunray has used four methods for determining sites where it is conducting geological tests: Surface geology, photogeology, geophysics (primary gravity meter surveys), and previous core holes and wells (which are comparatively few).

Core tests at varying depths are being made from a specially adapted shothole rig. Other field equipment includes a water truck, pickup truck, laboratory trailer, and crew trailer. All motor vehicles are four-wheel drive to assure mobility in the sandy, almost-roadless plateau.



ONE of the world's most desolate deserts, the Mojave, is being searched for possible oil and mineral deposits.

The laboratory is equipped with a complete wet chemical-analysis setup which permits chemical determination of any mineral. A petrographic microscope, oil-immersion equipment, and Geiger counter (actually a Scintillator) are included.

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crete, telling the core-hole number and exact location. The crew does all its own surveying and makes its own roads.

... Director. Directing the field operation is R. G. (Bob) Maynard, regional geologist for Sunray's Pacific Coast area. Maynard, former UCLA instructor of petrography, heads the team which maneuvers in the desert on a military-like basis and lives in the desolate region 4 days a week. The crew works four 10-hour days a week.

Working with Maynard are geologist Jack Leach, of Reseda, Calif.; T. J. (Monty) Griffith, drilling foreman from San Fernando; and a hand-picked three-man team of hardy field men consisting of Bob Chadwick, head well puller from Taft; Ray Cantrell, well puller from Fillmore; and Jay Stevens, roustabout from Newhall.

... Living conditions. The two trailers are air-conditioned to provide the crew an escape from the blistering heat which often soars to 125° in midsummer. Two refrigerators assure the men fresh foods. A small shower is available but the husky outdoorsmen find it handier to take a sponge bath out of a big wash basin than to squeeze into a trailer's shower nook.

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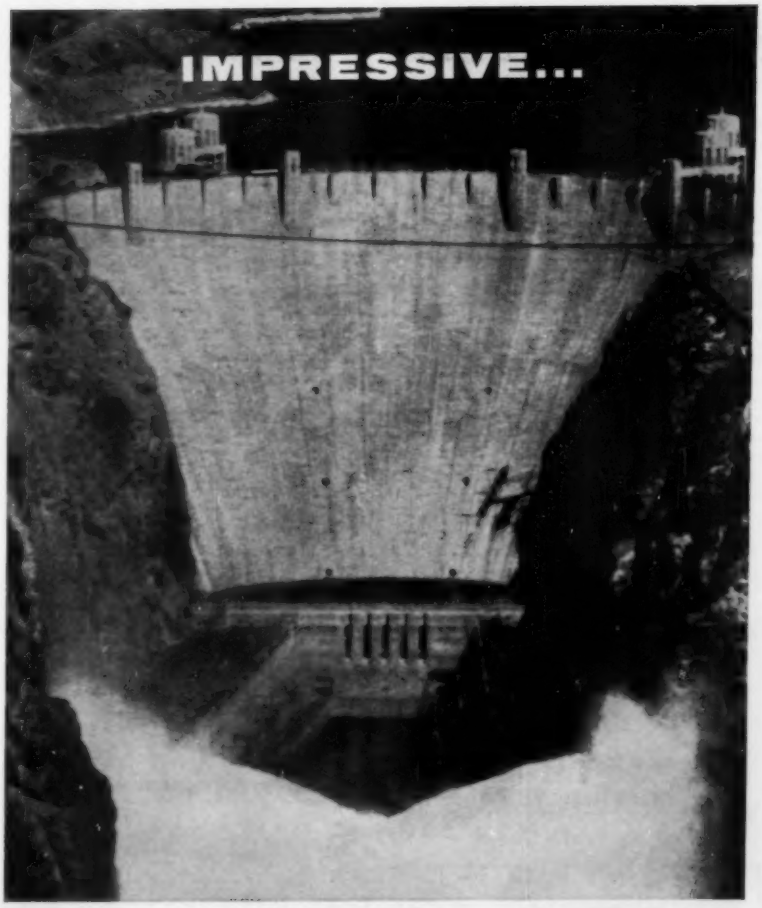
Bleak, inhospitable and ovenlike, the Mojave stands today as the same region of desolation that has existed for centuries. The animal life consists of desert terrapins, kangaroo rats, rattlesnakes, coyotes, tarantulas, flying ants and eerie-voiced owls. The only life consists of cactus, sagebrush and the forlorn Joshua trees.

... Mojave geology. Geologists say the 25,000-sq.-mile quadrangular region that is now Mojave was covered at least twice in ancient periods by an encroaching blanket of ocean. The region later raised itself to a precipitous land of sheer, needle-like volcanic crags and deep chasms. Volcanic ash, mud, lava, and effects of erosion at last filled the gorges; then great chains of warm lakes, linked by the now-dry Mojave river, supported a life of tropical verdure and roaming animals. Slowly, with the rising of encompassing mountain ranges, the Mojave became a cooped-in desert.

Today, all that remains are some 50 scorched valleys and scarred, worn-down mountain ranges. No lakes survive, nor rivers.



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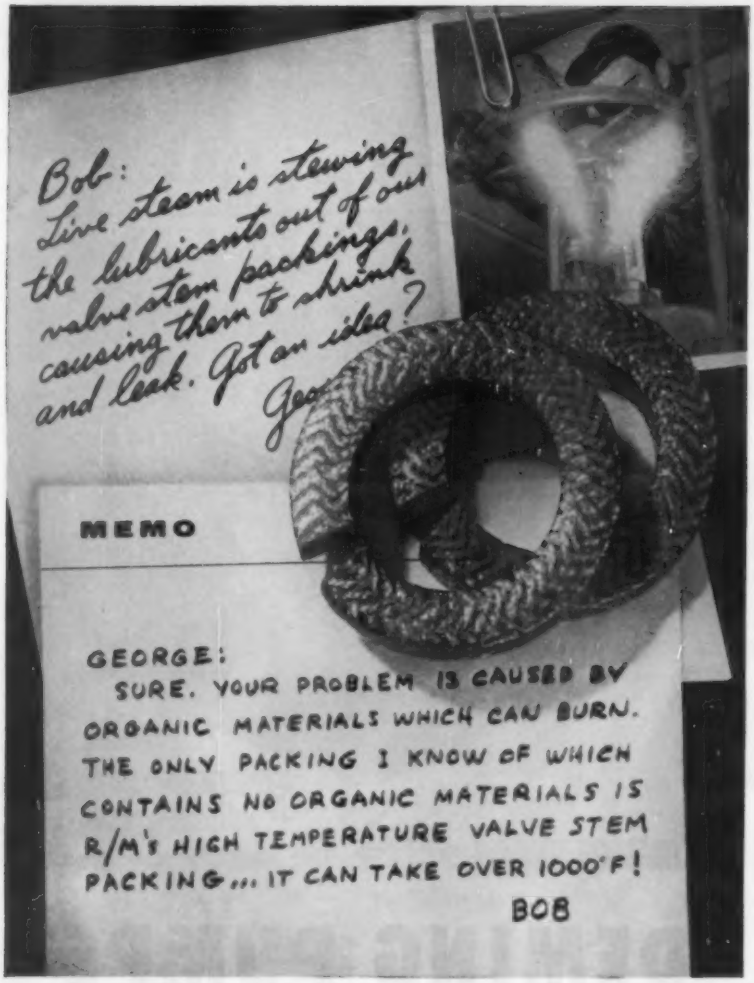
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Tests slated for California offshore

A CORE-DRILLING PROGRAM has been started by The Texas Co. on the 3,840-acre Santa Barbara County offshore parcel it holds jointly with Monterey Oil Co. and Newmont Oil Co. Texaco was using the mobile platform recently used by Standard Oil Co. of California to evaluate a similar lease in the same area. The platform was drilling in 83 ft. of water. The core program is designed to evaluate the lease and determine a site for construction of a permanent drilling platform.

Gas tests active in North California

IN SACRAMENTO, Standard Oil Co. of California successfully extended production in the Walnut Grove area with a well ¾ mile southwest of a pool discovered in 1956 by E. L. Doheney. The Standard well, 3 McCormack-Williamson, was completed flowing 3,760 M.c.f.d. of gas through a ⅛-in. choke from an interval at 3,685-93 ft.

Also in Sacramento County, Henry Hottinger, operator, was gun-perforating a test at River Island which gave indications of being a commercial new-pool discovery. The operator was completing it at 3,448-52 ft. and 3,456-70 ft.

In Glenn County, McCulloch Oil Exploration Co. of California was completing a well in the Beehive Bend Gas field offsetting production at General Petroleum Corp.'s section 20 unit. The McCulloch well flowed at a rate of 1,110 M.c.f.d. on a drill-stem test of the interval 3,271-75 ft.

Seven rigs probe North Tejon field

IN CALIFORNIA, Reserve Oil & Gas Co. was nearing completion of its second Olcese well in the pool it discovered last July ½ mile south of the main area of North Tejon field.

A recent drill-stem test of this second well, 115-20 Reserve-Dunlavy, flowed 36.4°-gravity crude at a rate of 900 bbl. daily from the Olcese at 7,310-7,469 ft. The well is one location east of the discovery which tapped the Olcese at 7,337-7,485 ft. for initial production of 622 bbl. daily.

Elsewhere in this Kern County field, operators were busy with ex-

tension tests in both the Highway and Main areas. The most interesting of these were:

... **Standard Oil Co. of California** was drilling below 4,527 ft. on a test located about 1½ miles northeast of production in the main area of the field.

... **Richfield Oil Corp.** was drilling below 7,666 ft. on a well, the most northerly in the Highway area.

All told, there were seven rigs active at North Tejon making it and Buena Vista Hills field the most active in the state.

Western Kansas opens new-pool production

Western Kansas' Ness County has a new Mississippian pool at Barnett Oil Co. 1 Margheim, SE SE SE 17-19-21, 4 miles southwest of Ryersee field.

The new pool opener pumped 48 bbl. of oil per day from perforations at 4,339-47 ft.

Two-mile stepout produces in Canada

PROLIFIC oil recovery on a drill-stem test of a wildcat well in the Swan Hills area of West Central Alberta was reported by Pan American Petroleum Corp.

Pan American-British American Oil Co., Ltd., A-1 Swan Hills, located in LSD 14, 33-66n-10w 5M, flowed 56 bbl. of oil (no water) an hour through a ½-in. choke on a drill-stem test.

Recovery was from the interval 8,854-8,902 ft., which was also total depth at the time of the test. The test was in the Beaverhill Lake, topped at 8,848 ft. Gas-oil ratio was 142. Pan Am, which operates the well, plans to drill ahead for further testing.

Nearest Beaverhill Lake production is about 2 miles to the northeast of the 1-A Swan Hills. Pan Am and British American share interest in the well and in 92,000 crown reservation acres in the vicinity.

The well is located about 100 miles northwest of Edmonton.

Michigan field may get successful pay

AN AREA that has attracted considerable exploration in the past without commercial success may be headed for payoff with McClure Oil Co. and I. W. Hartman 1 Buesch, SW NE NE, 8-12n-14w, Newaygo County, flowing 30 and 40 bbl. on successive days natural.

Wildcat drilled Traverse lime pay at 2,100 ft. and operators decided to test at that point after well flowed total 108 bbl. in 4 days. Original objective was 2,800 ft. to test Dundee.

Union Development Co. drilled 51 ft. reef pay in Niagaran at 2 Kammer, SE SW SW, 22-4n-15e, St. Clair County, to establish over a mile-long north-south production area in Peters pool. Field development is down to three rigs but six wildcats are drilling in area.

Red-hot Kentucky field gets new map

THE THIRD EDITION of the oil and gas map of Green County, Kentucky, is now being issued by the Kentucky Geological Survey office at the University of Kentucky.

The second edition, which was issued last month, is no longer available. The current edition gives the locations of more than 700 wells, 650 of which are identified. This is an increase of 135 wells over those listed on the earlier map.

In addition to the numerical index which was included on earlier editions, the new map contains a tabula-

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tion of wells arranged in alphabetical order by farm name as a cross index.

Dr. Wallace W. Hagan, state geologist and director of the Kentucky Geological Survey, reported that the Green County oil field continues to be the most active area of shallow oil exploration in the nation. Production up to 300 bbl. of oil per day from individual wells has been obtained from the Laurel dolomite at depths ranging from 450 to 600 ft. Production from Green County has been estimated by some sources as more than 18,000 bbl. per day. "Exploratory drilling is continuing and is being extended into neighboring counties," Dr. Hagan added.

The maps may be obtained from the survey office on the University of Kentucky campus.

Discoveries jump in tristate area

ILLINOIS BASIN developments included strikes in Gibson County, Indiana, Wayne and Wabash counties, Illinois, and new-pay discovery in Daviess County, western Kentucky.

Indiana . . . Jackson sand oil production was opened in NE SE SW 28-3s-10w, 3 miles southeast of Fort Branch by T. W. George at the 1 Earl F. Rexing. The well was completed on pump for 90 bbl. of oil daily from 1,765-72 ft.

Another discovery in Gibson County is Messman & Webb 1 Pearl Woodburn in NW SW NW 2-2s-9w, 3 miles northwest of Oakland City. Saturated sand was found in the Jackson at 1,365-80 ft. A test in the Aux Vases at 1,580-84 ft. got 100 ft. of oil and 110 ft. heavily oil-mixed mud.

Illinois . . . In Wayne County, 5 miles south of Mount Erie, Calvert Drilling Co. is testing Rosiclare at the 1 Ollie Cunningham, NW NW SE 8-1s-9e. A drill-stem test at 3,332-68 ft. gassed to the surface in 3 minutes and flowed clean oil in 75 minutes. This is a ½-mile stepout discovery.

In Wabash County, 6 miles northwest of Mount Carmel, Development Associates 2 Thomas Shearer, 32-1n-13w, is an indicated Tar Springs (Jett sand) discovery at 2,054-64 ft. and a new-pay strike in the Benoist at 2,545-54 ft.

Kentucky . . . Cox Drilling Co. found new-pay production at 1 Homer Gordon in 13-O-27, ½ mile northwest of West Louisville in Daviess County. The Benoist-Bethel sand strike got 500 ft. of oil and 50 ft. of oil-mixed mud on test at 1,908-20 ft.

Oil, gas shows in Oregon wildcat

IN OREGON, Linn County Oil Development Co.'s wildcat 14 miles southeast of Albany reportedly has had a number of oil and gas shows enroute to its projected total depth of 5,000 ft.

According to scout reports, it had gas and oil shows on the ditch at 2,800, 3,000, 3,300 and 4,300 ft.

The operator was shipping casing to the well site from California for further drilling and testing.

Dakota produces in San Juan field

DAKOTA oil production was established in northwestern New Mexico's Gallegos field, San Juan County Gallup giant.

El Paso Natural Gas Products Co. completed its 1-C Delhi-Taylor in NE SW SW 4-26n-11w, as a dual oil producer in both the Dakota and Gallup Cretaceous rocks.

Flow from the Dakota was 20 bbl. daily; 100 bbl. per day from the Gallup. This opens first Dakota production in the field (oil). There is a Dakota gas well at Pan American Petroleum Corp. 1 Randel.

THE OIL AND GAS JOURNAL

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Montana's Glacier gets another pool

ANOTHER Cut Bank discovery is reported in northwestern Montana at a Glacier County wildcat. The new strike is Pattie Hannah, and Moberly 1 Swenson, SE SE SE 10-37n-5w. A drill-stem test in the Cut Bank at 2,633-53 ft. got 37 bbl. of oil in 2 hours.

The second test at 2,650-76 ft. recovered 1,760 ft. of oil. Coring is proceeding in the Madison topped at 2,771 ft.

Location of the new discovery is about 1 mile southwest of booming Red Creek field, a Madison and Cut Bank producer.

Sooner oil moves farther west

OKLAHOMA'S westernmost oil producer is Skelly Oil Co.'s 1-G Oklahoma in NW NW NE 30-5n-6eCM, 12 miles west of Keyes gas field in Cimarron County.

This Panhandle discovery pumped 240 bbl. of oil daily, 37.6° gravity, from perforations in the Cherokee-Pennsylvanian sand at 4,099-4,108 ft.

The Dalhart basin discovery should stir a look into the potential of this far-western Oklahoma area.

Oklahoma gas report issued

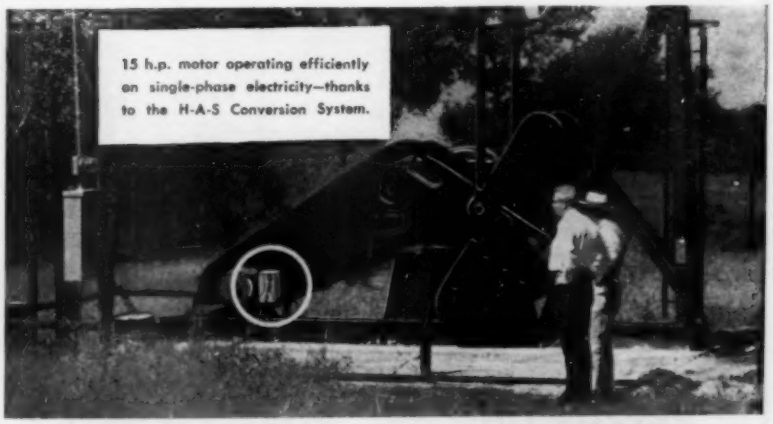
A NEW cumulative gas report on Oklahoma is the first state-wide report of its kind and furnishes valuable information about a long neglected, but very important segment of the oil and gas industry. Published by Kilgore and Barby, Oklahoma City consultants, it contains detailed information on approximately 12,000 gas wells. It lists each well by location, with operators, purchasers, withdrawal dates, rock pressures, and cumulative totals. The source of information was the Corporation Commission purchaser file which dates from the year 1915 to the present. This was used to build individual month-by-month statistics for each well.

With the recent trend toward higher gas prices and lower oil allowables, many companies are turning to exploration for gas reserves as a means of survival in Oklahoma. It is a sound practice to determine the economics of an undeveloped area by relationship to the productivity of a similar area. After development has started in an area, this report provides an accurate yardstick to calculate the total reserves by comparison of pressure decline with the total amount of gas produced.

Report could also provide market prospects for operators with shut-in wells by showing current purchasers in adjacent areas. Drainage caused by overproduction or lack of proper development is vividly shown in many areas of the state for the first time. More equitable withdrawals can be expected if attention is focused on the outstanding cases.

The report is presently available with state-wide coverage or individual area coverage.

One of the many highlights of this report is that the largest gas well in the state, production wise, is in Garfield County. It is 1 Rhodes, operated by Kay County Gas, in 30-23n-3w, and is still active after producing 30 billion cubic feet of gas. Another outstanding well is the 1 McBee Unit, in Leflore County, operated by Stephens Production, in 29-9n-24e, which has produced 27 billion cubic feet of gas. To illustrate the tremendous potential of the Morrow sand in northwestern Oklahoma, a well in Texas County, the 2 Sturgeon, operated by Panhandle Eastern has produced 12 billion cubic feet of gas in less than 2 years. This well is located in 3-5n-12e.



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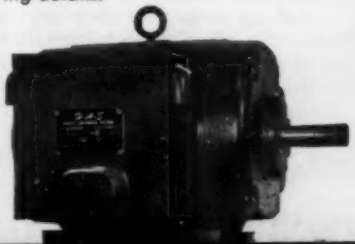

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Oklahoma gas pool gets oil producer

HIGH-GRAVITY OIL production is reported at a well in Beaver County, Oklahoma Panhandle. The well is Ohio Oil Co.'s 1 Snell in C NE SW 16-3n-26eCM, Ridgeway field. Nearest production (oil) is 3 miles to the south at Clear Lake.

Ohio's discovery is a Chester-Mississippian well at 7,620-36 ft. It flowed 250 bbl. of 40.5°-gravity oil in 11 hours on ½-in. choke. Gas-oil ratio was 7,000:1. On ¼-in. choke the well made 34 bbl. in 9 hours with a gas-oil ratio of 18,600:1.

Ellis County . . . Other northwestern Oklahoma news includes two new indicated strikes in the Shattuck and Salon areas.

Pan American Petroleum Corp. 1 Batt Unit, C NW SE 32-21n-25w, just southwest of Shattuck town, flowed 1,500 M.c.f.d. of gas from Morrow-Pennsylvanian at 10,054-60 and 10,-107-11 ft.

The other discovery, Pan American's 1 Herndon, C SE NW 35-24n-24w, flowed 2,570 M.c.f.d. of gas from the Morrow at 7,990-8,015 ft.

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Buckeye wildcat is new oil strike

OHIO'S Preston Oil Co. reported the successful completion of a wildcat on W. H. Massie, Lot 14, Knox Township, Holmes County. Clinton sand, found at 3,378-3,420 ft., was fractured and flowed 62 bbl. on a 24-hour test.

Penn pool opens in Texas Panhandle

CLEVELAND - PENNSYLVANIAN sand production was opened by Sunray Mid-Continent Oil Co. at the 1 J. E. Herleman in central Ochiltree County, Texas Panhandle.

The well, 4 miles southeast of Perryton town, flowed 175 bbl. of oil daily on 17/64-in. choke from perforations at 6,904-23 ft. Location is in Section 15, Block 13, T&NO Survey.

Rodessa well hits in East Texas

NORTHERN Freestone County gained a gas-condensate discovery at Watburn Oil Co. 1 Anderson-Edens.

Calculated open-flow potential was 4,600 M.c.f.d. of gas, plus 42 bbl. of condensate per 1 M.M.c.f. Rodessa perforations at 6,654-65 ft. were treated with 2,000 gal. of acid.

Operators have requested discovery status and new field name of South Winkler. Location is 6 miles east of Streetman in the J. Roque Survey, A-525. Nearest production is from the Pettet, in South Streetman field.

Basal Frio pays in Central Gulf

DISCOVERY of a new oil-productive area in southeastern San Patricio County, in Texas' central coastal region, is reported by Carrl Oil Co., operator, and Lion Oil Co. Division of Monsanto Chemical Co., joint owner.

Discovery well, 1 Dubose, is 6 miles north and 1 mile east of Gregory, and 7½ miles east of Taft. It is 1½ miles northwest of Harvey field, nearest production.

Completion is in the Commonwealth section of basal Frio formation at 9,372-80 ft. Completion flow was at the rate of 233 bbl. of 33°-gravity oil per day through 10/64-in.

choke. Flowing pressure was 700 psi.

The well was drilled to 9,877 ft. Its basal Frio formation also had indications of gas production in a zone at 9,296-9,326 ft.

Nearby Harvey field, discovered in 1950, is productive of oil and gas from Frio sands from 8,000 to 9,000 ft.

Salt dome searched in East Texas

NEW exploration work was under way last week in the Steen salt dome of northern Smith County. The wildcat is G. C. Clark Salt Dome Exploration Co., Tyler, 1 J. M. Mims. At last report the well was nearing contract depth of 5,600 ft.

Location is 4 miles east of the town of Lindale, in the Williams Moore Survey, A-711.

Nearest dry hole is W. F. Nenny 1 Braziel, about 1 mile due east in Thomas Rives Survey. This well went to 7,014 ft. A recent test, furnishing subsurface control, is Gulf Oil Corp. 1 W. G. Atwood, Maria De Los Angeles Carmona Survey. It was dry at 9,287 ft., total depth. On elevation of 491 ft., the Gulf well logged the Austin chalk at 5,025-5,190 ft., Woodbine 5,750 ft., and top of the Paluxy at 9,040 ft.

Tulsa firm hits in two states

TWO important wildcats were completed by Pan American Petroleum Corp., one in Wyoming, and the other in Oklahoma.

Pan American 1 Robinson, located in 32-50n-67w, Crook County, Wyoming, pumped oil at the rate of 294 bbl. a day on a 24-hour potential test. Recovery of the 28°-gravity oil was from the Minnelusa through perforations 6,065-80 ft.

The Minnelusa was topped at 5,982 ft. and the well was drilled to a total depth of 6,587 ft., plugged back to 6,120 ft. Nearest Minnelusa production is at Donkey Creek field, located about 5 miles west of the 1 Robinson.

Pan Am owns full interest in the well and in about 6,000 acres in the immediate area. The well is about 1 mile northeast of Moorcroft, Wyo.

. . . and in Oklahoma Pan American also completed a wildcat gas and distillate well in Carter County, Oklahoma. The Pan Am 1 Nolen, located in 12-5s-1e, flowed 3,250 M.c.f.d. of gas a day and 12 bbl. of 59°-gravity distillate an hour on a completion test.

Recovery, through a 20/64-in. choke, was from the Springer through perforations 8,165-75 ft., with top of pay at 8,066 ft. The 1 Nolen was drilled to a total depth of 8,540 ft., plugged back to 8,350 ft. It is now shut in.

On an earlier drill-stem test, 1 Nolen recovery was measured at the rate of 12 M.M.c.f.d. of gas with a spray of distillate.

Pan American holds full interest in the well and in some 4,000 acres in the area. The well is located about 2 miles southwest of Ardmore.

Successful Wildcats

COLORADO

Garfield County: American Metals Climax, Inc., 2 Government, 31-7s-104w. IP 1,070 M.c.f.d., Dakota 3,871-83 ft., Morrison 4,008-14 ft. TD 4,410 ft. Discovery of Prairie Canyon field.

Logan County: W. C. McBride and Coronado 1 Fortner, NW NE SE 8-9n-52w. IP 3,250 M.c.f.d., "D," 4,552-98 ft. TD 4,768 ft. New pool.

Gulf Oil Corp. 1 Cheairs, C SE SE 11-10-n-55w. IP 5,040 M.c.f.d., "J" sand, 5,438-46 ft. TD 5,527 ft. New gas pool.

Morgan County: Vessels and Strain 1 Alles, C NW NW 26-4n-60w. IP 113 BOPD, 113 BWPD, "D" sand 6,199-6,204 ft. TD 6,319 ft. Opens Rake field.

The Texas Co. 1 Morgan County Investment Co., C SW SE 31-5n-59w. IP 10

COOLING TOWER INSTALLATION

In the typical cooling tower installation shown above, the motor — outside the humid or corrosive atmosphere — is connected by a floating-shaft coupling to the gear box under the large slow-speed, horizontal-blade fan.

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THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PENNSYLVANIA, U.S.A.

BOPD, 5,900-30 ft. TD 6,182 ft. New pay discovery at North Bijou, the Greenhorn.

ILLINOIS

Bond County: Floyd E. Thompson 2 Mayfield, NW NE SW 33-6n-2w. IP 128 BOPD, 12 BWPD, Hardin 2,288-97 ft. TD 2,348 ft. Extension to Woburn pool.

Clay County: The Texas Co. 5 M. A. Allison "C," SE NW NW 31-3n-6e. IP 225 BOPD, 139 BWPD, Renault 2,761-70 ft.; Aux Vases 2,794-2,824 ft.; Benoist 2,699-2,714 ft. TD 2,829 ft. New pay for Kenner pool (Renault sand).

Clinton County: Brand Oil Co. 1 Wieberg Bros., SW SE SW 9-1n-5w. IP 48 BOPD, Silurian 1,966-75 ft., 1,989-2,000 ft. TD 2,028 ft. Discovery of East Newbaden pool.

Effingham County: Farrar Drilling Co. and Walter Duncan 1 Webster, NW SW NE 34-6n-6e. IP 128 BOPD, 18 BWPD, Cypress 2,420-36 ft. TD 2,470 ft. Oil discovery of North Hord pool.

INDIANA

Gibson County: Noah Petroleum Co. 1 Sullivan, NW SE NW 20-3s-13w. IP 63 BOPD, Cypress 2,443-48 ft. TD 2,448 ft. Discovery of West Foots Pond.

Spencer County: Cato Enterprises 1 Mackin, SE SW SE 6-7s-5w. IP 90 BOPD, Aux Vases lime 1,227-35 ft. TD 1,235 ft. New pay and extension to South Grandview pool.

KANSAS

Butler County: Adair Oil Co. 1 Classen, NW NW SE 6-24s-4e. IP 10 BOPD, 39°, Mississippian 2,441-51 ft. TD 2,451 ft. Opens Northeast Mellor pool.

Edwards County: L. C. Smitherman 1 Martin, SE SE NW 8-26s-16w. IP 22 BOPD, 20 BWPD, 37.3°, Kinderhook 4,458-68 ft. TD 4,516 ft. Opens Northwest Trousdale pool.

Ellis County: Rupp-Ferguson 1 Chrisler, NE SW NE 34-11s-16w. IP 83 BOPD, 5% water, 19°, Arbuckle 3,395-98 ft. TD 3,425 ft. Opens Chris pool.

Graham County: Burch Drilling Co. 1 Jackson, C SW NW 36-7s-23w. IP 110 BOPD, 26% b.s. and w., 38°, Lansing 3,669-71 ft. TD 3,750 ft. Opens South Fabricius pool.

Burch 1 Kerman, NW NW NE 35-10s-23w. IP 88 BOPD, 41.4°, Lansing 3,699-3,702 ft., 3,734-36 ft. TD 3,800 ft. Opens Southwest Prairie Glenn pool.

KENTUCKY

Henderson County: George A. Hoffman 1 M. Watkins, 22-P-24, IP 50 BOPD, lots of water, O'Hara 2,392-93 ft. TD 2,535 ft. Extension to North Anthoston pool.

Ward Dayton 1 P. G. Campbell, 24-Q-26. IP 28 BOPD, McClosky "B" 2,092-2,100 ft. TD 2,240 ft. Discovery of South Reed pool.

Muhlenberg County: Fred Rowe 1 Geibel, 25-J-28. IP 112 BOPD, McClosky 2,064-70 ft. TD 2,070 ft. Extension and new pay for New Cypress pool.

NORTH LOUISIANA

Catahoula Parish. Charles Kelley et al. 1 Elmas McClure, NWc 39-7n-6e. IP 40 BOPD, 40 BWPD, 42°, Wilcox 5,187-89 ft. TD 6,012 ft. Discovery of Carr Lake field.

Claiborne Parish: A. J. Hodges, Industries, Inc., et al. and Carter Oil Co. 1 Dobbins et al., Unit "A," C SE SW NE 12-19n-6w. IP 21,170 M.c.f.d., Cotton Valley "D" 7,917-25 ft.; Cotton Valley Bodcaw 7,972-92 ft. TD 8,218 ft. Discovery of new pay "D" sand at Sugar Creek field.

SOUTH LOUISIANA

St. Landry Parish: Slick Oil Co. and Harry Hurt 1 Higginbotham unit, 46-7s-5e. IP 84 BOPD and 1,939 M.c.f.d., 13/64-in., 58°, TP 3,200 psi., perf. 9,396-9,406 ft. TD 10,226 ft. New pay in east extension area of Arnaudville field.

Terrebonne Parish: Petroleum Inc., and Harry Hurt 1 Cole et al., 22-17s-18e. IP 2,450 M.c.f.d., 10/64-in., TP 4,350 psi., perf. 11,285-88 ft. TD 13,248 ft. New pay and 1-mile extension in East Houma area.

MISSISSIPPI

Pike County: George Harrison and D. A. Biglane 1 Bryant estate, NW NW NW 14-4n-8e. IP 385 BOPD, 11/64-in., 39°, TP 1,290 psi., perf. 10,746-78 ft., lower Tuscaloosa. TD 10,950 ft. Elev. 408 ft., lower Tuscaloosa 10,646 ft. Extends Little Creek field 2 miles south.

MONTANA

Glacier County: Hyland Oil Corp. 1 State, C SE NW 36-37n-6w. IP 700 M.c.f.d. Sunburst 3,034-52 ft. TD 3,375 ft. Discovery of South Blackfoot area. Shut in gas well.

NEBRASKA

Banner County: Petroleum Inc. 1 McMurray, C NE NE 28-17n-55w. IP 140 BOPD, "J" sand 6,320-28 ft. TD 6,390 ft. Opens McMurray pool.

Braden Drilling Co. 1 Meads C, C SE NE SW 33-20n-55w. IP 50 BOPD, "J" sand 5,462-68 ft. TD 5,500 ft. Opens Mead pool.

Kimball County: Shoreline Petroleum Co. 1

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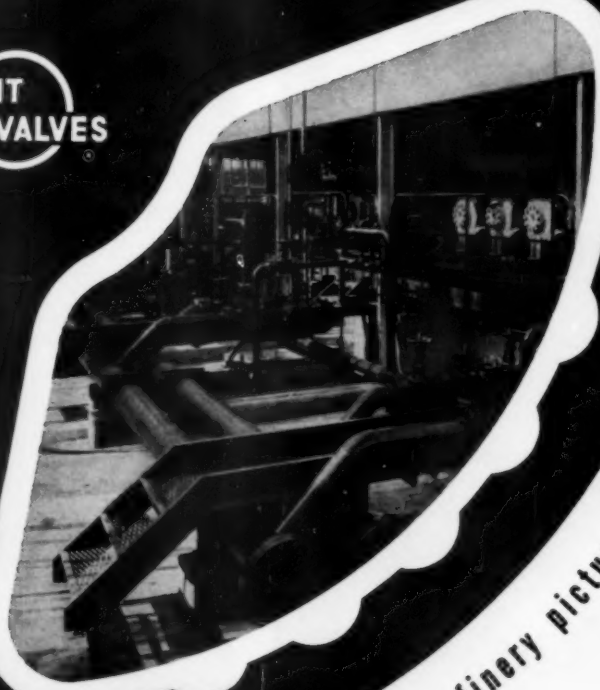

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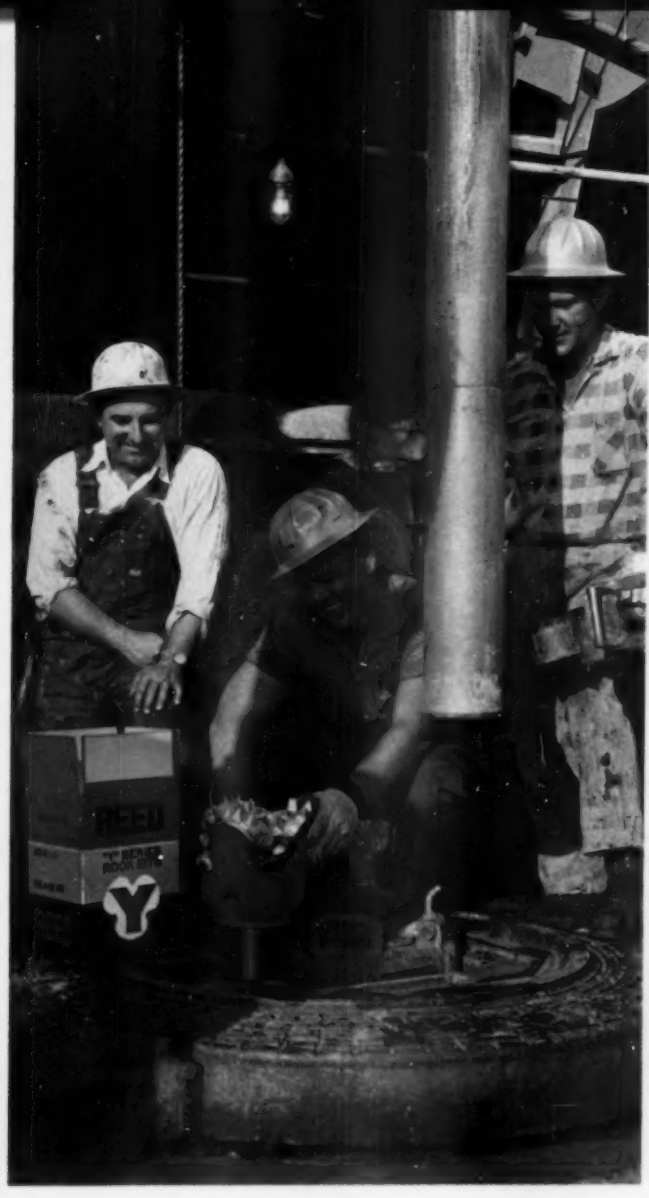

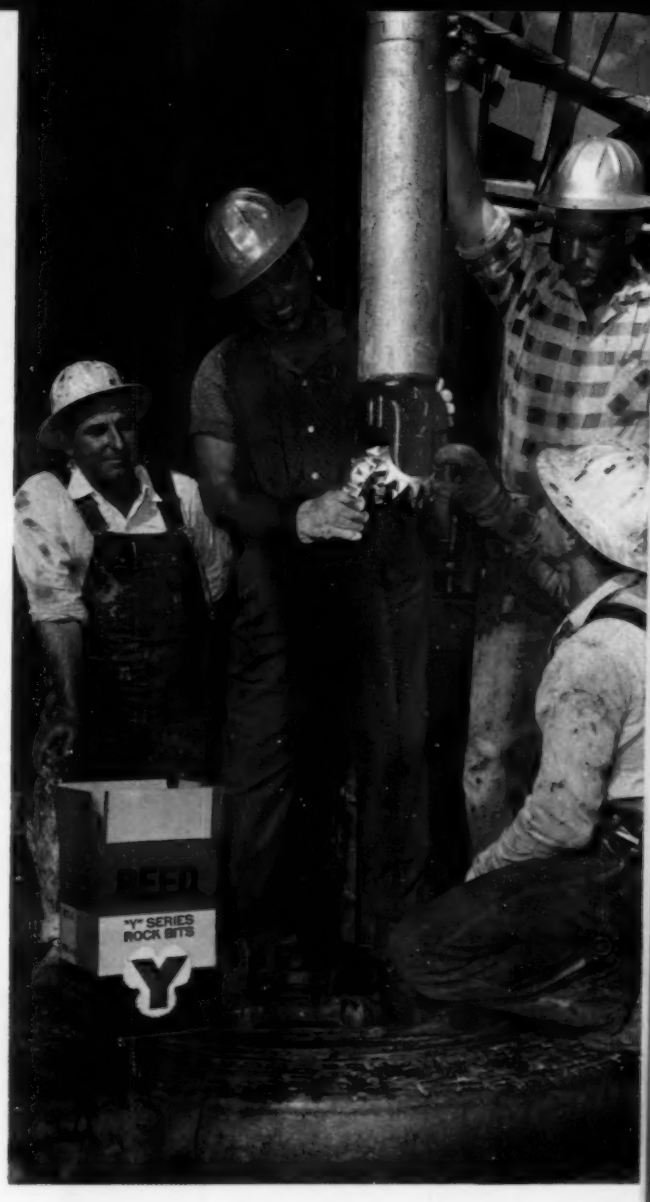

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FLUID PACKED PUMP CO.
PLANT AND MAIN OFFICE, LOS NIETOS, CALIFORNIA

Hinshaw, C NE SE 12-13n-55w. IP 100 POPD, 57 BWPD, "J" sand 6,202-07 ft. Opens Hinshaw pool.

Petroleum, Inc. 1 Maas, C NE SW 4-13n-54w. IP 167 BOPD, "J" sand 6,044-48 ft. TD 6,125 ft. Opens Maas field.

NORTH DAKOTA

Bottineau County: The California Co. 1 Bert Henry, SE NE 7-161n-79w. IP 79 BOPD, 37.6°, Spearfish-Triassic 3,385-98 ft. TD 3,473 ft. Discovery of Haram field.

McKenzie County: Skelly Oil Co. 1 Otto Tank, C NE NW 34-152n-96w. IP 218 BOPD, 8⅝ b.s. and w., 40.3°, Madison 9,176-84 ft. TD 9,305 ft. Opens Bank pool.

OKLAHOMA

Caddo County: Cities Service Oil Co. 1 Weidenmaier, SE SE NE 16-6n-12w. IP 64 BOPD, 33°, Viola 7,002-7,100 ft. TD 7,962 ft. New oil discovery.

Cleveland County: Petroleum, Inc., 1 Tullius Unit, C SW NE 16-8n-2w. IP 432 BOPD, 41°, Tulip Creek 8,256-68 ft.; Oil Creek 8,706-10 ft. TD 8,917 ft. New oil pool.

Grant County: Reading & Bates, Inc., 1 John Frantz, 29-27n-3w. IP 18 BOPD, 110 BWPD, 270 M.c.f.d., 34.8°, Red Fork 4,694-4,120 ft. TD 4,936 ft. Opens South Deer Creek pool.

Logan County: Domestic Oil Co. 1 Hattie E. Lowder, SW NE 23-16n-4w. IP 312 BOPD, 42°, Bartlesville 5,916-26 ft. TD 5,975 ft. New oil pool.

EAST TEXAS

Freestone County: Watburn Oil Co. 1 Anderson-Edens, J. Roque Sur., A-525, 6 miles east of Streetman. IP 4,600 M.c.f. gas, open flow, plus 42 bbl. condensate per 1,000 M.c.f., Rodessa 6,654-65 ft. BHP 3,050 psi., shut in. TD 7,502 ft., elev. 371 ft

Knox County: Paragon Corp. 1 A. J. Loran, Subd. 2, D. G. Burnett Sur. 16, A-9, 3 miles north of Munday, ½ mile north of Tannehill production, separated by dry holes. IPP 84 BOPD, 35°, GOR 375, Tannehill sand 2,056-60 ft TD 2,120 ft.

Wilbarger County: Tom B. Medders 1-B Charlie Matysek, Sec. 9, Blk. 8, H&TC Sur., 12 miles southwest of Vernon. IP 277 BOPD, 40°, GOR 200, Canyon limestone, open hole, 3,194-3,202 ft. TD 3,202 ft., elev. 1,336 ft.

SOUTHWEST TEXAS

Duval County: J. W. Gorman 2-B Farmers Life Insurance Co., Section 559, HK&K Sur., A-565, 8 miles northeast of Freer. AOF 6 M.M.c.f.d., dry gas, shut-in TP 785 psi., perf. 2,390-98 ft. TD 2,405 ft. New field.

Oil Lease Operating Co. 1 Fitzsimmons, Sec. 295, AB&M Sur., A-30, 12 miles northwest of San Diego. IP 88 BOPD, 10/64-in., 44.6°, GOR 890 cu. ft. per barrel, TP 1,828 psi., perf. 5,028-33 ft., Yegua 2nd. sand, and shut-in gas well, no gage, perf. 5,140-47 ft., Yegua 3rd. sand. TD 5,400 ft. New field.

Tiger Minerals 1-H Peters, Sec. 178, W. H. Brooks Sur., 14 miles southwest of Freer. IP 83.52 BOPD, P-37 choke, 26.9°, TP 70 psi., GOR nil, perf. 2,227-33 ft., upper Argo sand. TD 6,056 ft. New pay in East Peters field.

TEXAS GULF COAST

Jefferson County: Drew Cornell, Inc., 1 Judice, Sec. 7, Block 54, T&NO Sur., A-239. AOF 225,000 M.c.f.d., GLR 15.3 M.c.f. per bbl., 52.1°, shut-in TP 7,098 psi., perf. 10,581-10,601 ft. TD 11,005 ft. Extends Port Acres field ¾ mile west.

Newton County: Sun Oil Co. et al. 1 Holmes, W. M. Cochran Sur., A-66, 9 miles southeast of Call. IP 78.86 BOPD, 7/64-in., 45.1°, GOR 3,435 cu. ft. per barrel, TP 1,875 psi., perf. 7,060½-62 ft. TD 7,904 ft. New field 1½ miles east of Dougar field.

WEST CENTRAL TEXAS

Haskell County: R R. Carey 1 A. A. Bradford, Georgetown Sur., A-973, 8 miles west of Rochester. IPP 107.5 BOPD, 40°—, GOR 450:1, pay 5,038-43 ft. TD 5,080 ft., elev. 1,583 ft.

WEST TEXAS

Ector County: Slick Oil Corp., Brown & Spice 1 N. G. Story, 8-B15-PSL Sur., 4 miles west of Penwell. IP 180 BOPD, 41°, GOR 550:1, TP 270 psi., Pennsylvanian 7,938-58 ft. TD 11,213 ft. Ground elev. 2,982 ft. New pool.

UTAH

Carbon County: Great Lakes Natural Gas Corp. 1 Stone Cabin Unit, 13-12s-14e. IP 5 M.M.c.f.d., Wasatch 4,953-78 ft., 4,994-5,020 ft., 5,183-5,203 ft., 5,306-24 ft. TD 5,514 ft. Jack Canyon discovery.

Uintah County: El Paso Natural Gas Co. 1 Southman Canyon Unit, 29-10s-24e. IP 4,700 M.c.f.d., 122 BOPD, 61.1°, 5,942-66 ft. TD 6,031 ft. Southman Canyon discovery.

(Continued on page 184)

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TEXAS GULF COAST

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(Continued on page 184)

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Esso's Reeves Lauds Research

. . . as an integral part of a company's operations. He has witnessed its tremendous growth during the last 28 years.

INDUSTRIAL RESEARCH is a business. As such, it deserves to be run on a businesslike basis, even to the extent of conducting research on research.

Basically, it's an organized effort by a company to provide the technology it needs for growth. And a tie-in between fundamental research and industrial research shouldn't be anathema to the academician. For the important thing is whether the frontiers of knowledge are being pushed back.

These thoughts come from E. Duer Reeves, the new executive vice president at Esso Standard Oil Co. Reeves was executive vice president of Esso Research & Engineering Co. before taking over his new post, which also includes a position as director and vice chairman of the executive committee of the Esso board.

Reeves joined the company in 1930 following graduation from Williams College and graduate work at Princeton University. He began working at what is now called "industrial research," although it wasn't called much of anything at that time, he recalls.

His duties have included basic and applied research, pilot-plant operations, engineering, product development studies, plant tests, and a host of other activities. He has been particularly concerned with management since his election in 1947 as a director and vice president of the research company.

E. Duer Reeves
. . . outlines research's role.

A research veteran . . . Reeves has seen industrial research grow from a $300 to $400-million industry in 1930 to more than 10 times that today, employing more than 500,000 people.

And in spite of its tremendous size —industrial research accounts for about 1.5% of gross national product—it is currently growing at the rate of 12% a year. Reeves sees no sign that it will slacken.

Reeves has been associated with some of Esso Research's major accomplishments, including the development of fluid catalytic cracking and butyl rubber. His early activities included experiments on manufacture of synthetic fatty acids by wax oxidation and acetylene production from hydrocarbons using an electric-arc process.

He also conducted tests resulting in the construction of a plant for dewaxing lubricants with the use of chlorinated solvents.

Reeves' interest in industrial research has not been limited to tangible achievements, however. He says that more important than industrial research's physical growth has been its corresponding growth in responsibility and prestige. There was a time when research was a rather mysterious activity carried out in an academic atmosphere. The company did not really understand research or the people engaged in it, and the research scientists often neither understood nor particularly cared about the operations of the company.

Reeves points out that industrial research has grown into an entirely new relationship with industry. It is now an integral part of a company's operations and an important factor in its competitive strength.

Planned approach . . . Reeves has

▶▶▶ Personals

Vernon Van Sant, Jr., has been named manager of Ashland Oil & Refining Co.'s new Calgary division office.

O. L. Clevenger has been promoted to senior supervising engineer in the technical division of Humble Oil & Refining Co.'s Baytown, Tex., refinery.

Dave Evans, independent geologist, has been elected president of the Rocky Mountain Association of Geologists. Other officers are **Fred Jensen,** Juniper Oil & Mining Co., first vice president; **Eugene Shearer,** Knox, Bergman & Shearer, second vice president; **John Deuth,** Superior Oil Co., secretary - treasurer; **Charles Severy,** Hiawatha Oil & Gas Co., and **Gordon Hurd,** independent, counselors.

B. J. (Bill) Robbins, drilling superintendent for Barnwell Offshore Inc. at New Orleans, has been named vice president and general manager of the Gulf Coast area.

D. W. Melder, Jr., has been appointed superintendent of Pan American Petroleum Corp.'s Salt Creek gasoline plant near Midwest, Wyo. He succeeds **G. A. Ayling,** who has been named Salt Creek field superintendent.

O. B. (Gus) Trotter, independent operator, has been named vice president, production, for Chemoil Corp. He will head the company's new production department. Chemoil recently announced plans to buy producing properties, royalties, and leases. Trotter was with the Louisiana State Mineral Board before becoming an independent. He was area general superintendent of production and drilling with The Texas Co. before that time.

Don Luff has been named district geologist for Sunray Mid-Continent Oil Co. in Casper, Wyo. He succeeds **Paul V. Hoovler,** who recently resigned.

Julius Babisak, Calgary district geologist for Atlantic Refining Co., has been transferred to Corpus Christi, Tex., as Southwest Texas district geologist. **Fred A. Hildenbrand,** senior geologist in Calgary, will succeed Babisak there.

Robert D. Vaughn, Shell Development Co.; **George L. Houghton,** Socony Mobil Oil Co., and **A. B. Metzner,** University of Delaware, have won the 1958 Junior Award of American Institute of Chemical Engineers. The award goes to the young engineer who contributes the best technical paper to publications of AIChE. The three wrote a joint paper on heat transfer.

been a leading spokesman for industrial research.

He was honored by his contemporaries by being selected 1955-56 president of the Industrial Research Institute.

Reeves advocates a planned approach to research. He says sensible planning requires research of research activities to make them more productive, more useful, and more efficient. And this can be done without infringing upon highly creative staff members, he says. Most important, he adds, concentrating on getting accomplishments doesn't mean that basic research is being pushed into the background.

Reeves believes that basically, time is the critical dimension in research. Fundamental knowledge should be ready when needed; the applied process or products should be available when they are needed; and the commercial applications should be ready when they are needed. Knowledge, says Reeves, has usefulness not only in terms of its application but also in terms of time.

His preoccupation with the cause of industrial research has not made Reeves oblivious to the most important assets of a research company—men, not machines. He points out that the best machine to be built will never replace the creative engineer.

And, as a busy administrator, he hasn't become detached from his staff. For instance, he has made the rounds at Christmas time, shaking hands and extending personal greetings to the 3,000 employes at Esso Research—a staff which wishes him well in his new job.

Albert E. Benson, assistant supervisor with Amerada Petroleum Corp. in Mogadiscio, Somalia, Africa, has been transferred to Casper, Wyo., in the same capacity.

W. A. Myers, assistant general manager of Atlantic Refining Co.'s research and development department, has been appointed acting department manager. He succeeds **H. W. Field,** who has been given a leave of absence because of health. Field has resigned as a director and vice president of Atlantic.

C. H. Coughlin, northern sales region manager for Standard Oil Co. (Ind.), has been named general manager of sales for American Oil Co., Indiana Standard subsidiary. **Guy D. Carroll,** sales promotion manager in Indiana Standard's Chicago office, will succeed Coughlin. The appointments are effective January 1.

Floyd B. Odlum, president of Atlas Corp., has been elected chairman of the board. He will continue as chief executive officer. **David A. Stretch,** executive vice president, has moved up to president.

Walter Squires, Jr., chemical engineer in Esso Research & Engineering Co.'s design engineering division, has been named an engineering associate. A graduate of Massachusetts Institute of Technology, Squires joined Esso in 1937.

Donald L. Redman, manager of operations and a director of Central-Del Rio Oils, Ltd., has been elected vice president, operations. A graduate of the University of Alberta, Redman was staff engineer in the Calgary office of California Standard Co. before joining Central-Leduc Oils, Inc., as chief engineer in 1952. He later became manager of operations and a director. Central Leduc and Del Rio Producers, Ltd., were merged in 1957 to form Central-Del Rio Oils.

H. M. Thorne has been named research director at the U.S. Bureau of Mines Laramie, Wyo., petroleum research center (formerly the petroleum and oil-shale experiment station). He succeeds **H. P. Rue,** who recently retired. **John S. Ball** will continue as coordinator of petroleum research with **Walter I. R. Murphy** as coordinator of oil-shale research. **H. N. (Jack) Smith** has been appointed superintendent of the research center. **Perry R. Davis,** former administrative officer at the Bureau's oil-shale experiment station near Rifle, Colo., has been transferred to Laramie in the same capacity. **H. C. Tamman** will continue as head of mechanical services at Laramie. **Malcolm D. Smith,** administrative assistant, is in charge of the Rifle plant, now inactive except for maintenance.

E. C. Hurd, administration manager of Trans Mountain Oil Pipe Line Co., has been elected a vice president of the company and its subsidiaries. Hurd joined Trans Mountain in 1953 as manager of oil movements. He was refinery superintendent for Cooperative Refinery Association before that time. A graduate of the University of Saskatchewan, Hurd was at one time manager of British American Oil Co.'s Toronto refinery and assistant to BA's general manager of refineries.

▶▶▶ Personals

HAIDER

Michael L. Haider, president of International Petroleum Co., Ltd., has been elected a director of Standard Oil Co. (N.J.). He will succeed **Hines H. Baker** on the Jersey board. Baker, retired president of Humble Oil & Refining Co., will retire from Jersey January 1. **J. K. Jamieson,** vice president and a director of Imperial Oil, Ltd., will

BAKER

JAMIESON

succeed Haider as president of International Petroleum. Haider has been president of International Petroleum since 1954. He began his career with Jersey companies in 1929 with Carter Oil Co. He served at one time as chief engineer for Carter and as manager of production engineering and research for what is now Jersey Production Research Co. He headed Imperial Oil's producing and exploration department before becoming deputy coordinator of Jersey's worldwide producing activities. He went from this post to International. Baker, a director and member of Jersey Standard's executive committee, joined Humble Oil & Refining Co. in 1919. He became a director of Humble in 1937, vice president in 1941, executive vice president in 1945, and president and chief executive officer in 1948. He retired from this post last year and was named a director of Jersey.

Joe Lackey, vice president of Malco Refineries, Inc., has been elected president of the New Mexico Oil and Gas Association. Other officers are **Stanley Carper,** Carper Drilling Co., vice president; and **Paul Rutledge,** Santa Fe drilling contractor, secretary-treasurer. **Larry Byrd,** Humble Oil & Refining Co., has been named chairman of the executive committee. New executive committee members include **Prentice Watts,** Aztec Oil & Gas Co.; **J. N. Dunlavey,** Skelly Oil Co.; **H. W. Matthews,** Standard Oil Co. of Texas, Carper; and Rutledge.

Personals

J. W. Meehan, executive vice president and general manager of Derby Refining Co., has been elected a vice president of Colorado Oil & Gas Corp., the parent company. He will continue as president of Derby Oil Purchasing Co. and Jayhawk Pipeline Corp. Meehan was general manager of pipeline operations for Pure Oil Co. and later president of Pure Transportation Co., before joining Derby in 1957.

A. C. Baker, district geologist in Wichita Falls, Tex., for Tennessee Gas Transmission Co., has been transferred to Denver as district geologist. He succeeds **Ray Marvin,** who has been named geologist senior and transferred to special geologic evaluation duties in the Denver exploration district. **Robert G. Welch,** geologist in Wichita Falls, will succeed Baker as district geologist there.

E. L. Decker, president of Martin - Decker Corp., has been elected honorary regent of the National Oilfield Manufacturers and Delegates Society. Decker was instrumental in founding Nomads in 1938 and served as its first president. He will act as consultant and advisor to the Nomads national board of regents.

G. T. Gwin has been promoted to research specialist in Humble Oil & Refining Co.'s Baytown, Tex., research and development division.

Brook I. Smith has been named senior engineering associate for Esso Research & Engineering Co. A graduate of Purdue University, Smith joined Esso Research in 1928.

James L. Harden, formerly on loan to Texota Oil Co. as chief geologist coordinating joint operations of Texota and Ambassador Oil Corp., has been named Rocky Mountain division exploration manager for Ambassador in Denver.

John D. Stone, corrosion engineer for Sunray Mid-Continent Oil Co. in Lafayette, La., has been elected chairman of the Teche section of National Association of Corrosion Engineers. Other officers include **Sam E. Fairchild,** Texas Pipe Line Co., vice chairman; **Ron J. Cernik,** Union Oil Co. of California, secretary; and **Phil C. Brock,** Dowell, Inc., treasurer. **O. L. Bassham,** Tretolite Co., will continue as trustee.

Donald L. Katz, head of the department of chemical and metallurgical engineering at the University of Michigan, has been elected 1959 president of American Institute of Chemical Engineers. He was formerly vice president of AIChE. **Jerry McAfee,** vice president of Gulf Oil Corp., will succeed Katz as vice president of the association. Directors, elected to 3-year terms, include **W. R. Collings,** Dow Corning Co.; **W. B. Franklin,** Humble Oil & Refining Co.; **L. C. Kemp, Jr.,** The Texas Co.; and **Roland Voorhees,** Union Carbide Development Co.

James W. Kerr, vice president and general manager of Canadian Westinghouse Co.'s apparatus products group, has been named president and chief executive officer of Trans-Canada Pipe Lines, Ltd. He succeeds **Charles S. Coates,** Trans-Canada president since 1957, who has been named chairman of the board. Coates succeeds **N. E. Tanner.** Tanner will continue as a director. Kerr had been

KERR

COATES

with Westinghouse since 1937. He served as apparatus sales manager and general manager of the power products division before becoming general manager of apparatus products group and a vice president in 1956. Coates was executive vice president and general manager of Trans-Canada before becoming president in June 1957. He directed design, engineering, and construction of the pipeline system, which was completed in October. Tanner, retiring chairman, was minister of mines in Alberta before resigning to become president of Merrill Petroleums. He left Merrill in 1954 to become Trans-Canada president during the company's critical planning and building stage. He was named chairman last year.

Joe Ingram, formerly with Amerada Petroleum Corp., has joined Anson Petroleum Corp. as geologist.

Deaths

Thomas E. Lloyd, 75, pioneer driller, died recently in Los Angeles. Lloyd began his oil career in Pennsylvania. He moved to Texas during the Spindletop boom and later went to California. He was active in some of the country's most famous fields including Spindletop, Humble, Santa Maria, Salt Lake, Coalinga, and Signal Hill. He was drilling superintendent with California Petroleum Co. before forming Lloyd & Burns Drilling Co. during the Signal Hill boom. He later was a partner in Lloyd & Adams, drilling contractors. Lloyd also did pioneer drilling work in Trinidad and Japan in the early part of the century. He is credited with several improvements in drilling equipment, particularly addition of a third speed on the rotary drill.

Albert E. Purser, 66, Tulsa independent operator, died December 6 at his home after an illness of several months. Purser was superintendent of the old Savoy Oil Co. before becoming a partner in Adams-Purser, independent producing firm, in 1940.

Clyde E. Baker, 43, Denver sales representative for George E. Failing Co., died December 6 after a heart attack. Baker had been with the Failing Co. since 1943. He was manager of the Hattiesburg, Miss., branch at one time and later manager of the company's Los Angeles store.

R. U. McKinney, 50, retired geophysicist with Wood & Miller Engineers, Tulsa, died December 10 in a Tulsa hospital of cancer. He had been ill for the past year. McKinney was owner of Seismic Development Co. before joining Wood & Miller.

Harry E. Nowlan, president of Nowlan-Dodson Engineering Co., Evansville, Ind., consulting firm, died December 1. Nowlan was president of North Central Oil Corp., Evansville, before becoming a consultant in 1943.

Henry Elmer Haught, 58, retired independent driller, died December 6 at his home in Sapulpa, Okla., after a heart attack.

SANTOLENE C costs little to use . . . but a few parts per million "tames" the corroding tendency of all kinds of light petroleum fractions.

SANTOLENE C is an outstanding rust-inhibiting additive for gasolines, home and industrial fuel oils, kerosene, and Diesel and jet fuels.

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You'll find that this rust inhibitor reduces suspended sediment, protects metal, and does not affect the color of finished product . . . and does this at low cost. *Write:*

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Cold weather warms up heating trade

BY BILL BACHMAN

WINTER'S first real frigid temperatures gave zip to sales of light heating oils in the northern consuming states last week.

But the weather that petroleum marketers have been waiting for found distillate spot prices in the Mid-Continent refining area on the soft side.

Most marketers agree, however, that the price condition there may clear up soon, especially if the cold weather continues for a few more days.

This was the market outlook at midweek:

...Light heating oils. Sales boosted throughout the north. Spot prices ragged in Mid-Continent, off published lows as much as ½ cent. Prices steady in other areas and probably due for improvement in Midwest.

...Heavy fuel oil. Movements improved.

...LPG. Movements got an immediate shot in the arm as jobbers and dealers sent in orders to suppliers to meet increase in their refill business. Prices were steady, and may improve.

...Gasoline. Movement slowed appreciably, likely due to the heavy snows; but prices remained steady in spite of rise in primary stocks.

...Crude. Prices held steady in wake of 5-cent cut posted recently by Pure Oil Co. in three-state Denver basin.

A bitter pill . . . Some marketers had bitter comment for Mid-Continent pricing practices on distillates.

This group said it made little sense to raise heating-oil prices in August when sales are nearly nil and then lower prices in December right when the first chance to do high-volume business appears. That's what happened this year. Most suppliers raised distillate prices a cent a gallon in August. Many of these then shaved their prices by about a half cent recently to meet competition.

The price cuts in the Mid-Continent region reportedly came when one supplier offered distillates at a half cent off published lows through December. A few other refiners made similar offers on a spot basis, and for a time last week the Mid-Continent prices were in jeopardy.

Mid-Continent marketers in many instances thus lost an excellent chance to realize their full profit potential from the winter's first lift to the heating-oil business.

Refiners in the region now think that the current cold weather will give so much strength to the distillate market the low-priced material will be soaked up, and prices will hold at the published levels.

The supply of distillates at refineries and terminals is more than adequate for the present increased demand. The strong movement toward jobbers and dealers will cover their stock needs. Only chance of an emergency is in regions where heavy snows delay or prevent home deliveries of heating oils.

Good for propane . . . LPG suppliers were meeting the heavy demands for propane in stride.

Companies without exception reported heavy orders for propane in the northern tier of states. One firm dispatched 60 extra tank cars in one day early in the week. He added that nearly all dealers were ordering for storage fills. The dealers had reported steady streams of trucks moving out the fuel to homes in the frigid areas.

One supplier commented: "A little more of this kind of weather and we'll be even with last year's business. Only last month we had dealers canceling cars."

Another major supplier reported: "Business is swell, but we still have plenty of propane. If you hear of anyone who needs any, let us know."

Both comments were typical of the general heating-oil and LPG trade. Unseasonably warm weather over most of the nation in November had put a softness in demand. Sales lagged behind a year ago. But the two cold waves in late November and early December have changed the picture rapidly.

LPG marketers also advanced their prices a cent to 5 cents a gallon in August. Present demand has firmed that price, and any prolonged cold weather may bring better prices.

The U. S. Weather Bureau's long-range forecast for December calls for below-normal temperatures in the North and East, much below normal in the Great Lakes, near normal in the South and Southwest, and above normal in the extreme South.

Other fuels . . . Heavy fuel oils actually are showing a tightness in some Mid-Continent and southwestern areas.

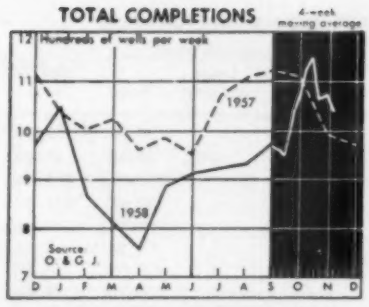
One Mid-Continent supplier reported the market was firm and movement strong to steel plants and other heavy industry in the Great Lakes area and also to commercial heating outlets. He attributed the pickup to generally improved industrial conditions and to a desire by many firms to have an assured standby fuel in case their supply of natural gas is interrupted.

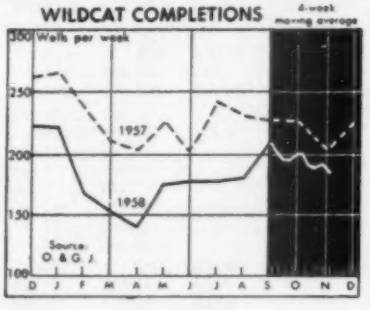
Gasoline, up until now, has enjoyed an excellent late fall demand. One refiner reported his gasoline sales volume was nearly as good last month as it was in the summer. Another supplier said the gasoline trade has been much better than last year through November but may slow down now in view of the weather.

The same good November weather which hurt heating-oil business helped gasoline, and the current cold weather has flipped the coin. Gasoline prices, however, have remained firm in spite of a slight increase in stocks going into storage.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,093,300	UP	90,750	UP	197,435
Crude stocks	258,298,000	UP	2,004,000	DOWN	21,427,000
Completions	989	DOWN	80	UP	83
Refinery runs	7,666,000	DOWN	119,000	DOWN	141,000
Gasoline stocks	174,305,000	UP	705,000	DOWN	13,782,000
Kerosine stocks	31,009,000	DOWN	923,000	DOWN	274,000
Distillate stocks	155,826,000	DOWN	5,613,000	DOWN	7,319,000
Residual stocks	65,237,000	DOWN	962,000	UP	6,398,000
Four-product stocks	426,377,000	DOWN	6,793,000	DOWN	14,977,000
Total imports	1,575,100	UP	75,600	UP	11,900





Active Rotary Rigs*

	12-8-58	12-1-58	12-9-57
Alabama	13	12	9
Arkansas	23	28	29
Arizona	1	1	1
California	95	88	97
Colorado	33	28	47
Florida	1	1	2
Georgia	....	....	....
Illinois	47	57	57
Indiana	5	8	5
Iowa	3	3	2
Kansas	160	141	162
Kentucky	8	8	10
Louisiana	336	337	381
North	40	44	46
S.-Inland waters	149	151	(‡)
S.-Land	108	100	256
Offshore	39	42	79
Maryland	1	1	1
Michigan	13	14	12
Missouri	2	2	....
Montana	29	26	33
Mississippi	61	54	50
Nebraska	22	17	32
Nevada	....	....	....
New Mexico	108	111	153
New York	1	1	1
North Dakota	35	32	48
Ohio	5	5	1
Oklahoma	268	247	257
Oregon	....	....	....
Pennsylvania	11	10	9
South Dakota	....	....	2
Texas	868	822	997
S.-Inland waters	8	8	(‡)
S.-Land	191	153	215
Offshore	2	....	5
North-East	182	188	(†)
West Central	308	296	(†)
West	177	177	(†)
Utah	37	40	56
Washington	....	1	1
West Virginia	2	2	4
Wyoming	86	82	67
Virginia	....	....	....
Total U. S.	2,274	2,179	2,526
Western Canada	182	176	180
Eastern Canada	1	....	2
Grand total	2,457	2,355	2,708

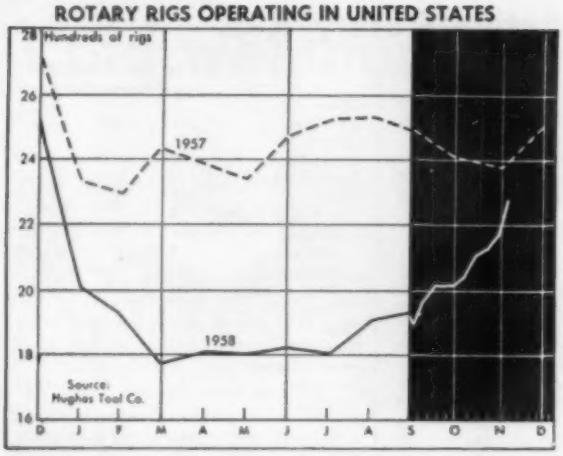
*Hughes Tool Co. †Comparisons not available due to change in method of reporting. ‡Included in South-Land.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 6, 1958

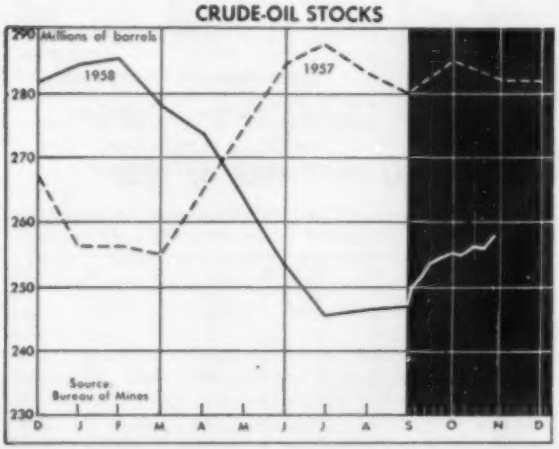
	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	0	0	0	0	0	0	0	70	74	0	0	0	0	0	26	26
Arkansas	15	4	1	0	9	1	52,341	751	1,034	4	0	1	0	3	152	192
California	25	13	0	1	7	4	111,969	1,402	2,094	6	0	0	0	6	345	494
Colorado	17	4	0	5	8	0	99,647	794	800	8	2	0	2	4	458	518
Illinois	74	22	0	3	27	22	166,982	2,256	2,530	9	0	0	1	8	431	601
Indiana	23	9	0	1	13	0	34,083	815	653	5	0	0	0	5	293	123
Kansas	84	42	1	4	34	3	300,830	3,770	3,970	19	2	0	0	17	791	774
Kentucky	24	19	0	0	5	0	22,479	1,737	1,430	2	0	0	0	2	164	299
Louisiana	88	44	9	3	31	1	639,755	3,266	3,626	15	2	0	0	13	482	639
North	35	18	0	3	14	0	136,764	1,280	1,356	9	1	0	0	8	218	192
South	46	23	8	0	14	1	438,116	1,594	1,635	6	1	0	0	5	240	363
Offshore	7	3	1	0	3	0	64,875	392	635	0	0	0	0	0	24	84
Michigan	3	0	0	0	3	0	10,231	403	413	1	0	0	0	1	133	142
Mississippi	12	7	0	0	5	0	107,933	377	365	4	1	0	0	3	163	188
Montana	13	5	0	1	7	0	42,503	312	415	5	0	0	1	4	124	174
Nebraska	12	2	0	0	10	0	68,971	687	836	7	1	0	0	6	327	455
New Mexico	19	14	1	2	2	0	85,966	1,811	1,993	1	0	0	0	1	246	250
West	9	6	1	2	0	0	38,349	890	849	0	0	0	0	0	94	96
East	10	8	0	0	2	0	47,617	921	1,144	1	0	0	0	1	152	154
New York	14	5	0	1	3	5	27,338	501	440	3	0	0	0	3	44	11
North Dakota	3	2	0	0	1	0	12,585	422	281	0	0	0	0	0	129	126
Ohio	21	10	0	5	6	0	56,642	969	1,058	0	0	0	0	0	17	18
Oklahoma	144	72	1	9	57	5	450,066	5,908	5,879	16	1	0	0	15	805	697
Pennsylvania	45	10	0	26	3	6	169,363	573	571	2	0	0	2	0	21	41
Texas	311	165	12	10	115	9	1,116,744	16,805	20,091	47	2	0	3	42	3,372	4,722
Dist. 1	29	19	1	0	9	0	52,796	922	1,168	1	0	0	0	1	346	401
Dist. 2	7	2	1	1	3	0	40,047	687	725	0	0	0	0	0	180	244
Dist. 3	23	10	2	0	9	2	139,248	1,191	1,544	3	0	0	0	3	268	423
Dist. 4	13	0	3	1	8	1	78,689	1,064	1,314	5	0	0	1	4	319	418
East	15	9	2	0	4	0	67,707	1,129	1,267	3	0	0	0	3	304	355
Dist. 7-B	59	21	0	0	37	1	140,254	2,359	2,737	12	0	0	0	12	646	929
West	80	57	3	2	18	0	361,904	4,795	5,703	12	0	0	1	11	653	807
Dist. 9	62	30	0	2	25	5	136,744	3,451	4,318	10	1	0	1	8	539	1,039
Dist. 10	23	17	0	4	2	0	99,355	1,243	1,315	1	1	0	0	0	117	106
Utah	2	1	0	0	1	0	11,218	361	234	0	0	0	0	0	77	119
West Virginia	19	2	0	16	0	1	47,805	724	656	0	0	0	0	0	18	31
Wyoming	18	3	0	2	13	0	95,613	702	810	5	0	0	0	5	238	283
Misc. (S.D., Wash.)	3	0	0	0	3	0	10,007	90	125	3	0	0	0	3	80	107
Total U. S.	989	455	25	89	363	57	3,741,071	45,506	50,378	162	11	1	9	141	8,936	11,030
Prev. week	1,069	529	22	60	430	28	4,140,287	.....	.....	223	21	1	4	197	.....	.....
Cum. 1958	45,506	22,381	1,042	3,437	17,377	1,269	184,143,173	.....	.....	8,936	855	142	248	7,691	.....	.....
Western Canada	39	25	0	4	10	0	187,504	2,308	2,810	8	1	0	0	7	607	804

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*
(Thousands of barrels)

	11-29-58	11-22-58	11-30-57
Pennsylvania	2,811	2,825	3,154
Other Appalachian	1,678	1,665	1,780
Illinois, Indiana, Michigan	10,472	9,923	10,488
Nebraska and North Dakota	2,416	2,568	3,103
Kansas †322,650	.....	†322,650	†335,000
Oklahoma	17,492	17,643	20,519
Arkansas	2,283	2,165	2,739
Louisiana	17,351	17,037	20,075
North	2,963	2,915	3,309
South	14,388	14,122	16,766
Mississippi, Alabama, Florida	2,591	2,630	2,804
New Mexico	8,169	8,590	9,501
Texas	112,956	111,090	124,576
East Texas	8,053	8,166	9,154
West Texas	54,548	54,291	54,785
Texas Gulf	19,958	20,118	25,868
Other Texas	30,397	28,515	34,769
Wyoming	14,066	13,515	13,672
Other Rocky Mountain	8,967	8,724	7,043
California	32,540	32,640	33,663
Foreign	†14,094	14,867	15,940
Total	258,298	256,294	279,725

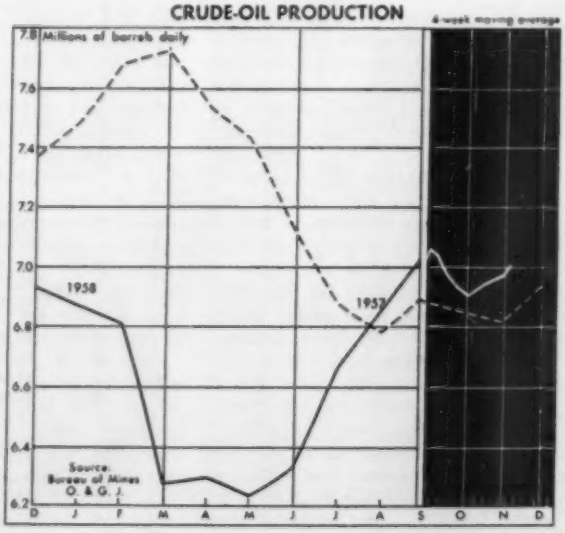
*Bureau of Mines. †Includes 4,749,000 bbl. in California.

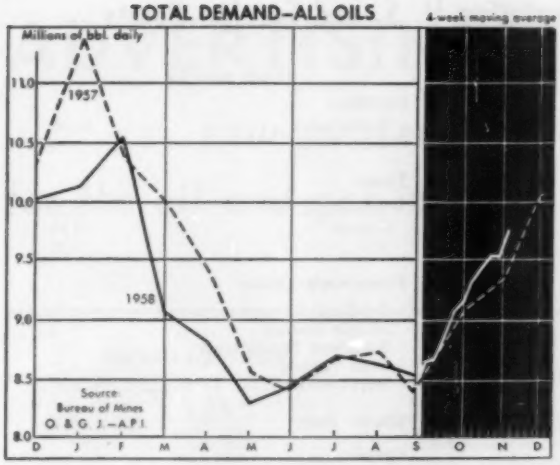
DAILY AVERAGE PRODUCTION FOR WEEK

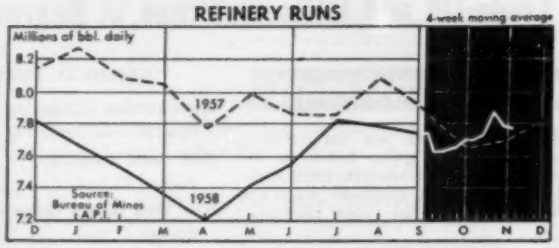
	December 6, 1958 Crude oil	Lease condensate	Total	Nov. 29 total
Alabama	16,400	.....	16,400	16,350
Arkansas	79,900	100	80,000	80,050
California	853,400	.....	853,400	855,800
Colorado	130,600	.....	130,600	131,400
Eastern	45,200	.....	45,200	44,500
Florida	1,200	.....	1,200	1,200
Illinois	229,800	.....	229,800	224,700
Indiana	31,500	.....	31,500	31,400
Kansas	†322,650	.....	†332,650	†335,000
Kentucky	60,500	.....	60,500	58,000
Louisiana	827,750	94,000	921,750	919,225
North	110,000	3,900	113,900	113,900
South	717,750	90,100	807,850	805,325
Michigan	24,300	.....	24,300	24,300
Mississippi	114,900	4,875	119,775	120,450
Montana	77,300	.....	77,300	77,900
Nebraska	59,600	.....	59,600	58,800
Nevada	100	.....	100	100
New Mexico	276,225	6,300	282,525	284,100
North Dakota	35,600	.....	35,600	32,300
Oklahoma	†559,300	.....	†559,300	†564,500
Texas	2,744,275	66,000	2,810,275	2,737,700
Dist. 1	45,575	1,450	47,025	47,700
Dist. 2	120,575	8,000	128,575	125,000
Dist. 3	375,275	33,000	408,275	392,000
Dist. 4	196,700	7,500	204,200	203,500
Dist. 5	30,725	400	31,125	30,400
Dist. 6	120,425	7,300	127,725	125,800
East Texas Field	157,425	.....	157,425	151,000
Dist. 7-B	140,150	100	140,250	138,075
Dist. 7-C	139,575	3,850	143,425	144,825
Dist. 8	1,102,000	2,000	1,104,000	1,069,000
Dist. 9	213,425	1,500	214,925	208,500
Dist. 10	102,425	900	103,325	101,900
Utah	97,400	.....	97,400	73,000
Wyoming	334,000	.....	334,000	331,600
Others	‡125	.....	‡125	‡175
Total U. S.	6,922,025	171,275	7,093,300	7,002,550
Change from prev. week—up			90,750	
Canada	†513,292	.....	†513,292	†478,949
Total U. S. production—Jan. 1-Dec. 6				2,260,390,580 bbl.
Same period last year (crude plus cond.)				*2,444,468,711 bbl.

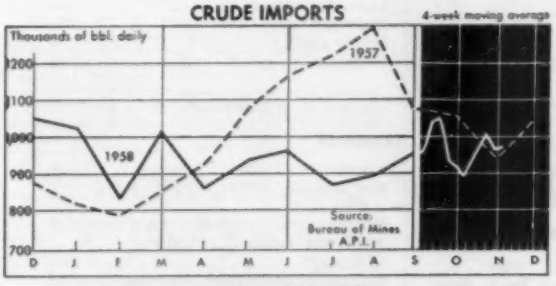
*Includes 47,826,615 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Washington.

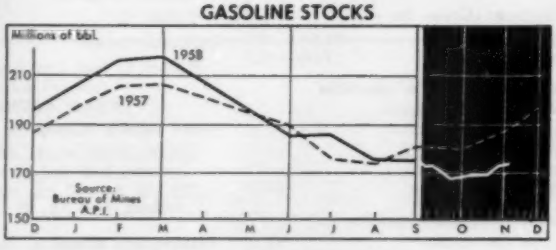
CRUDE-OIL PRODUCTION

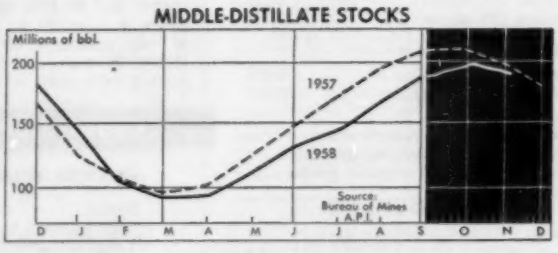


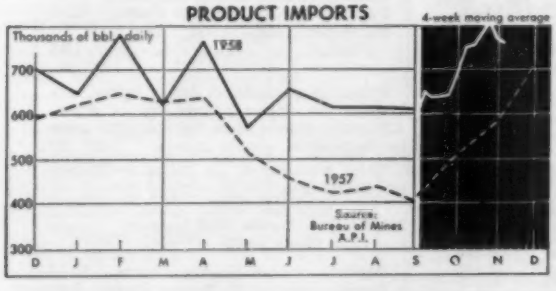

TOTAL DEMAND—ALL OILS
4-week moving average
Millions of bbl. daily
1957
1958
Source: Bureau of Mines O. & G. J.—A.P.I.
D J F M A M J J A S O N D

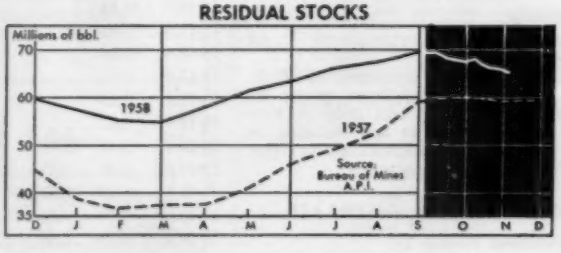












API REFINERY REPORT, DECEMBER 5, 1958

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, December 1957—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,084	511.6	39.0	355.9	121.4	40,837	12,801	57,684	12,582	1,201	499.9	38.7	349.4	194.5
Appalachian:														
District 1	99	42.0	3.3	19.2	12.4	4,441	555	3,753	298	108	44.6	5.4	24.9	10.8
District 2	104	56.7	4.3	21.9	13.3	2,415	529	1,439	197	105	55.2	7.7	18.6	16.8
Ind., Ill., Ky.	1,359	711.9	63.3	303.2	173.4	29,902	7,576	28,918	5,204	1,439	734.1	83.1	326.7	218.4
Minn., Wis., Dak.	105	51.8	6.3	28.4	9.0	7,272	1,456	8,163	585	105	52.3	6.0	25.2	11.6
Okla., Kans., Mo.	766	429.7	23.6	208.1	28.4	16,150	1,659	12,618	1,037	731	415.2	12.6	202.7	38.6
Inland Texas	266	199.3	3.4	46.4	21.3	6,734	379	2,552	2,149	266	207.2	9.9	49.6	23.3
Texas Gulf Coast	1,771	916.9	99.1	421.1	179.4	22,765	2,777	14,500	7,076	1,807	906.2	124.9	489.3	213.4
La. Gulf Coast	657	385.4	65.6	154.7	47.9	10,712	1,560	7,391	1,584	599	351.3	51.2	149.7	42.7
N. La. and Ark.	80	43.6	1.7	17.0	4.9	4,359	970	2,318	120	95	38.9	7.5	20.3	8.0
Rocky Mtn.:														
New Mexico	26	15.9	....	3.4	1.9	476	60	133	50	24	11.9	0.3	4.5	3.0
Other Rky. Mt.	280	125.7	3.8	64.3	34.7	4,812	310	2,877	1,043	256	126.6	4.0	63.1	36.2
West Coast	1,069	530.4	3.9	159.3	310.9	23,440	377	13,480	33,312	1,080	512.4	4.9	161.6	324.6
Dec. 5, 1958	7,666	4,020.9	317.3	1,802.9	958.9	174,305	31,009	155,826	65,237	7,816	3,955.8	356.2	1,885.6	1,141.9
Nov. 28, 1958	7,785	4,020.1	319.1	1,898.7	933.7	173,600	31,932	161,439	66,199	.....	.....	.....	.....	.....
Dec. 6, 1957	7,807	3,952.9	349.6	1,842.3	1,084.6	188,087	31,283	163,145	58,839	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.50-11.625
Premium (99 octane)	14.50-14.625
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.25
Regular (92 octane)	10.50
Premium (97 octane)	11.625
Premium (98 octane)	11.75
California (rack) (Los Angeles):	
Regular (88 octane)	12.25
Premium (94 octane)	13.25
Premium (98 octane)	14.25
Caribbean area (cargoes):	
Regular (87 octane)	9.875
Premium (97 octane)	11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.00
Diesel oil (58 d.i. and above)	9.75
Distillate No. 1	9.75
Distillate No. 2	9.00
Gulf Coast (cargoes):	
Kerosine 41-43	9.375
Distillate No. 2	8.875
New York Harbor (barges):	
Kerosine 41-43	10.20-10.70
Distillate No. 2	9.70-10.20
Diesel fuel, 48-52 d.i.	10.30-10.70
Caribbean area (cargoes):	
Distillate No. 2	8.625-8.875

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank car	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.50
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 pp., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 pp., 95 v.i.	20.5
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Okla-homa*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$1.86	....	....	....	....
15-15.9	1.95	....	....	....	$1.81
16-16.9	2.04	....	....	....	1.86
17-17.9	2.13	....	....	....	1.91
18-18.9	2.23	....	....	....	1.96
19-19.9	2.32	....	....	....	2.01
20-20.9	2.41	$2.52	....	$2.62	2.06
21-21.9	2.50	2.55	....	2.64	2.11
22-22.9	2.60	2.58	....	2.66	2.16
23-23.9	2.69	2.61	$3.44	2.68	2.21
24-24.9	2.78	2.64	3.46	2.70	2.26
25-25.9	2.87	2.67	3.48	2.72	2.31
26-26.9	2.96	2.70	3.50	2.74	2.36
27-27.9	3.06	2.73	3.52	2.76	2.49
28-28.9	3.11	2.76	3.54	2.78	2.54
29-29.9	3.16	2.79	3.56	2.80	2.59
30-30.9	3.22	2.82	....	2.82	2.63
31-31.9	3.27	2.85	....	2.84	2.67
32-32.9	3.33	2.88	....	2.86	2.71
33-33.9	3.38	2.91	....	2.88	2.75
34-34.9	3.44	2.94	....	2.90	2.79
35-35.9	3.49	2.97	....	2.92	2.83
36-36.9	3.55	3.00	....	2.94	2.87
37-37.9	3.60	3.02	....	2.96	2.89
38-38.9	....	3.04	....	2.98	2.91
39-39.9	....	3.06	....	3.00	2.93
40-44.9	....	3.08	....	3.02	2.95

*Top prices on other Oklahoma (sweet) postings vary from $3.15 to $3.01 a barrel. †Low cold test crude. ‡Sour.

Effective dates of broad changes: California, 9-30-58: East of California, January 3-10, 1957; Pennsylvania Grade, 6-18-58.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Ville Platte	3.30
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	3.90
Middle District	3.72
Southwest Pennsylvania	3.43
West Virginia	3.25
Buckeye Grade	3.25
Illinois Basin	3.00
Canada:	
Leduc-Woodbend	2.67
Redwater (Alta.)	2.56
Smiley (Sask.)	2.33
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.66
San Joaquin, 41°-41.9°, Puerto La Cruz	3.25
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26°-26.9°, Amuay*	2.55
Quiriquire, 16.0°-16.4°, Caripito	2.15
Lagunillas heavy, flat, Las Piedras*	2.10
Bachequero, flat, 15°-16°, Las Piedras*	1.93

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Ababan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC —10%)	$2.57
Gulf-U.S.N.H., dirty (ATRS —25%)	2.14
★ Carib.-U.S.N.H., dirty (USMC —51.25%)	1.32
★ P.G.-U.S.N.H., dirty (USMC —72.5%)	3.49

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USED PIPE AND USED TANKS—For Sale. Rogers & Wright, Incorporated, 216 West Second Street, Tulsa, Oklahoma; 710 Peoples Building, Charleston, West Virginia.

WALKER-NEER S-32 Spudder for sale complete with all size tools and '58 Chevrolet Pickup. Good for top to bottom drilling to 1500 feet or workover to 3500 feet. Phone 322-1173 or write 203 Robertson Building, Wichita Falls, Texas.

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8⅝" RECEDING diehead with lead screw and taper attachment. Equipped with 2 speed motor and 8 sets of dies for 8 round, 10V and 8V threads. Bargain price. B & B Pipe & Tool Co., 3035 Walnut Ave., Long Beach, Calif. Phone GArfield 4-0704.

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2—Cat storage hoppers, 25' x 70'.
2—Reactors, 8' x 34'9", Disp. plates.
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1,800 ft. 5½" 20#, J-55, liner pipe,	$2.42 ft.
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HELP WANTED

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PETROLEUM GEOLOGIST experienced in water flooding, also in superintending drilling operations, and in locating or making deals on properties on which to drill. Box K-991, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER — Mechanical or petroleum with experience in design of oil and gas production equipment. P. O. Box 546, Sand Springs, Okla.

PRODUCTION MANAGER, to take full charge of oil and gas production activities of small company situated in southeastern Oklahoma. Prefer age 35-45. Salary open. For prompt appointment, write giving full details of background and experience. (Our employees know about this ad.) Box K-989, The Oil and Gas Journal, Tulsa, Oklahoma.

RADIOACTIVITY Logging Operators with perforating experience openings in Oklahoma and Kansas. Jetwell, Inc., 932 Mayo Building, Tulsa, Oklahoma.

PETROLEUM ENGINEERS

Opportunity for experienced production, drilling, and reservoir engineers. Require BS or MS degree and 5 to 8 years drilling, production, reservoir engineering or research experience. Salary commensurate with experience. Attractive company benefits. Assignments in Saudi Arabia and New York.

Write giving full particulars of personal history and work experience to:

Recruiting Supervisor, Box 386

ARABIAN AMERICAN OIL COMPANY

505 PARK AVENUE, NEW YORK 22, N. Y.

HELP WANTED

EXPERIENCED Water Flood Engineer with a thorough knowledge of associated field problems and reservoir performance by large independent oil company for permanent assignment in Colombia, South America. Furnish photo, full information regarding education, experience and personal history. All inquiries will be kept in strictest confidence. Box K-973, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT: Lists about 40 U. S. oil companies, 30 drilling contractors, operating abroad, showing where apply foreign jobs. $3 cash. OIML Co. Box 2603, Tulsa, Okla.

GENERAL SALES MANAGER wanted by aggressive petroleum marketing company with headquarters in Tulsa. Must be experienced in sales promotion, well known in the industry and have full knowledge of specifications of petroleum products as well as pricing schedules. Some traveling necessary. Excellent opportunity with chances for advancement for right man. Please reply Box K-855, The Oil and Gas Journal, Tulsa, Oklahoma, giving age, qualifications, references and expected starting salary. All replies will be treated strictly confidential.

ENGINEERS

Opportunity to become permanently associated with a sound, long-established, continuously expanding company, known for its aggressive leadership in industry. Liberal benefits and excellent working conditions. Design engineers with 5 years minimum experience. Mechanical engineering degree preferred. Must be capable of organizing and completing projects assigned and should be familiar with oilfield hoist and equipment. Modern plant located in small town in fast developing area. (All replies confidential—Interview arranged at your convenience.)

BOX K-936,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

RATE & ECONOMIC RESEARCH MAN NATURAL GAS

Opportunity with natural gas pipeline company. College graduate, some engineering background, industrial competitive fuel analysis and operating company rate experience essential. Location in Midwest. Salary open, experience and capacity controlling. Send complete resume to:

Box K-987,
The Oil and Gas Journal,
Tulsa, Oklahoma.

SENIOR COMMUNICATIONS ENGINEER

Major pipe line company with offices in Midwest has need for qualified engineer experienced in both microwave and wire line communications. Must be familiar with all types of communication and related equipment and capable of design, cost estimating, and preparation of economic studies on new facilities or revision or expansion of existing facilities. Must be capable of writing and interpreting specifications for units of communication equipment or for communications system. Required to supervise communications study section, including dealing with other company groups or outside groups such as equipment suppliers or partners in jointly-owned systems.

Write, giving resume of education, experience, and qualifications, including picture and telephone number.

BOX K-993, THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

HELP WANTED

PRODUCTS TERMINAL ASS'T. SUPERINTENDENT

Handle barge loading, unloading, truck movements, short pipe line. Completely able to maintain quality control and inventory. Furnish resume and availability. Eastern location.

Box K-977, The Oil and Gas Journal, Tulsa, Oklahoma.

Geophysicist Wanted

Position open for seismologist with broad geographical experience; review and supervisory; with Major Independent. Permanent location Tulsa. In reply give personal history, educational qualifications, and details of professional experience. Salary open.

Box K-995,
The Oil and Gas Journal,
Tulsa, Oklahoma.

SITUATION WANTED

EXPLORATION GEOLOGIST, 33, Married, family, Masters, desires relocation. 8 years experience; 5 rig supervision, well completions, workovers, 3 consulting. Prefer aggressive independent or investment group, advancement opportunity. Experienced all phases oil business. Excellent references. Box K-976, The Oil and Gas Journal, Tulsa, Oklahoma.

SUPERINTENDENT, production, gasoline or pipeline; 46, available immediately, 28 years experience production, cable tool drilling, pipe-line, gas systems and plants. Last ten years gas plants in West Texas. Box K-959, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 31, 7 years experience production, drilling, reservoir, valuation, secondary recovery. Oil and gas. Desires responsible position with aggressive company. Box K-980, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—B.S. Degree in Petroleum Engineering, 9 years varied experience, including evaluation and purchase of properties, planning and operation of waterfloods, negotiation of units, reserve estimation, well completions. Registered Engineer. Commercial pilot's license. Presently employed by major company. Box K-982, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER, 30, over seven years experience in South America in refining and natural gasoline operations as process, project, contact, and economics engineer. Desires permanent U. S. position as process engineer. Box 31R 178, 4041 Marlton Ave., Los Angeles 8, Calif.

GEOLOGIST—B.S. 50, 3 years major, good subsurface experience. Box K-990, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Mechanical Engineer, West German, 44, single going, living in South America, German, English, Spanish speaking, 15 years experience: 70% in project, design, calculation, construction supervision of refineries and chemical plants, 30% workshop supervision, power plants. Offers service in USA or abroad, residence permission for USA. Box K-992, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: 31, married, 7 years diversified experience West Texas and New Mexico. Not afraid of hard work, with definite oil finding ability. Desire association with aggressive organization where rewards are commensurate with effort and ability. Will relocate. Box K-997, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—36, eight years diversified engineering experience in production, unitization, secondary recovery, reserve estimates, cost estimates, and workovers. Resume and interview on request. Box K-998, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED

CHEMICAL ENGINEER. 30—married, family—M.S. Petroleum Refinery Engineering. Six years chemical engineering experience with major petrochemical company. Successful record of trouble-shooting, cost reduction, expansion design, startup, coordination, supervision. Management oriented. Desires Superintendent, Process Engineering. Box K-999, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION ENGINEER—Six years active experience in equipment, completions, well workovers, secondary recovery, automation, etc. Ambitious and with responsibility. Speak Spanish fluently. Desire position in the States or abroad. Will relocate and travel. Box L-102, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION MAN, 35 years old, Degree Geology, Ex-army Pilot, 3½ yrs. Service Co. experience. Presently Production Superintendent with Independent. Experienced all phases production, secondary recovery. Prefer Production job. Box L-101, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING PRODUCTION LAND/ACCOUNTING

Open for connection with Independent or drilling contractor. 18 years experience includes successful managerial positions with established companies. Furnish complete resume upon request. Box L-100, The Oil and Gas Journal, Tulsa, Oklahoma.

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MAPS

WE HAVE AVAILABLE the most accurate oil maps and information for those interested in Cuba's oil development. Write to M. A. Noguera, P. O. 336, Havana, Cuba.

LEASE AND DRILLING BLOCKS

UTAH, Geologist and Landman will provide "forward looking" program for principal in leasing Federal land in Paradox, Uintah, and Kaiparowitz basins. Box 375, Salt Lake City, Utah.

ALASKA—For oil leases in Active Bethel Basin based on good geology and near big operators, contact Jack Antry, 1010 Mayo Bldg., Tulsa, Oklahoma.

I OWN AND OFFER 180 acres, minerals—4 tracts—in Harper and Major counties, Oklahoma. Worth $100.00 per acre. Will accept $50. Package deal. Box K-988, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—Government 40 acre oil leases in Arizona, N. M. & Calif. You do no drilling yet. You share in fortunes made from oil on public lands. Payments if desired. Free information & maps of booming areas. Real Estate Investments, Ltd., 24 N. Wabash Ave., Rm. 822, Chicago 2, Illinois.

ALASKA LEASES

Leases for sale or will file for you in select areas near major companies' acreage.

BOX K-984,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

MONEY RAISING

FINANCIAL CONTACTS, Underwriters, Brokers, Private Finders of Capital reached. No shopping. Confidential. FREE ENTERPRISE ASSOCIATES, 817—51st St., Brooklyn, N. Y.

CAPITAL WANTED to finance drilling deals, production, lease acquisition, development. Excellent position to find, evaluate, develop, manage drilling, production operations. E. L. Thomas, Box 3771, Tulsa. RIverside 7-5337.

PRODUCTION FOR SALE

HAVE 15-20 BARREL wildcat well—A-1 equipment—new 7" casing—more pay perforated—needs frac job. Located on 900 acre block in Luling area on good faulting. Good possibilities in Eagleford, Buda and Edwards formations. Owner will sell one-fourth to one-half interest in well and block. Box 26, Seguin, Texas.

650 ACRES oil-gas lease. Two wells producing. Quick sale $25,000.00. Box K-996, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION WANTED

PRINCIPALS with unlimited funds seek any-sized oil-gas production or development. Send all data in strictest confidence. Box K-972, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Oil properties. 100 to 5,000 barrels daily in Oklahoma and Kansas. Morris Sitrin, P. O. Box 1160, Tulsa, Okla.

5—100 BARRELS DAILY oil production. Send all details. Moco Production Co., Box 1388, Wichita Falls, Texas.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

BUSINESS OPPORTUNITIES

WANT ASSOCIATE for manufacturing and selling Lease Automatic Custody Transfer (Lact) and Desander equipment. Gulf Coast. W. Thomson—1342 Jones, San Francisco 9, Phone PRospect 5-3944.

ILLINOIS, MICHIGAN and OHIO territories now open for sales and service organizations to represent us in a complete line of production equipment. Our line of equipment fits in well with practically all production equipment service organizations. Commissions far above average. Box K-985, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW PRODUCTS WANTED

Well-established, responsible company with complete facilities for developing, manufacturing and marketing oil field equipment is seeking new or improved products, preferably patented or patentable, to add to its presently well-known line. Royalty basis or outright purchase. Initial submission should identify product and general use without revealing engineering and confidential detail. Submissions will be handled promptly and confidentially.

Box K-994,
The Oil and Gas Journal,
Tulsa, Oklahoma.

PERSONALS

PAN AMERICAN CONSULTANTS, a newly formed partnership specializing in oil and gas development in Latin America has opened offices in the Maryland Casualty Building in New Orleans, and the Ambar Motor Building in Havana, Cuba. The partnership is composed of John F. Bricker, Management; Fernando Freyre, Legal; James R. Crow, Geological.

ELECTRIC LOG CABINETS

FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-24 4-drawer cabinet. Two compartments to each drawer with separate follow blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for catalog 58-B. Ross-Martin Co., P. O. Box 800-A, Tulsa, Okla.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Denver, Colorado. Notice is hereby given that 11.22 acres of land in one parcel within the known geologic structure of Greenwood Field, Baca County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 2 p.m., M.S.T., January 15, 1959, when bids will be opened. Details of the lease offering, how and where to submit bids, and forms, may be obtained from the Bureau's Land Office, P. O. Box 1018, Denver, Colorado. John L. Rankin, Manager.

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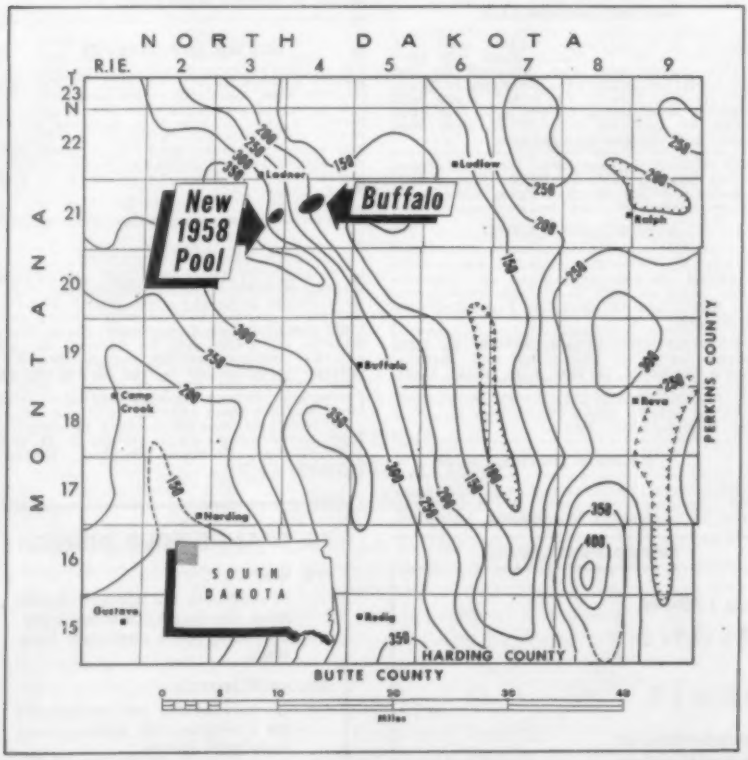
Box 1260 **Tulsa 1, Okla.**

OIL AND GAS TESTS in South Dakota, 1957, compiled by Allen F. Agnew, state geologist of South Dakota, South Dakota Geological Survey, is a new oil and gas investigations map recently published. This well-illustrated map reveals that exploration during 1957 continued at the same rate as in 1956. Most of the wildcats drilled in the state were in the Williston basin, and on the edge of the Black Hills. None of the Williston basin tests got to the Precambrian; only nine topped the Red River-Ordovician, and two got no deeper than the Newcastle.



A MAGNETOMETER MAP of Harding and Perkins counties, South Dakota, by Bruno C. Petsch, was recently released by the South Dakota Geological Survey. The Harding County portion of this map is shown here. The only production in the Williston basin portion of the state is in this county. There is some small production in the southwestern corner of the state on the fringe of the Powder River basin.

Successful Wildcats

(Continued from page 171)

WYOMING

Carbon County: Atlantic Refining Co. 3 Unit, 34-25n-86w. IP 3,644 M.c.f.d., 1,176 BOPD, 43°, Tensleep 6,891-6,955 ft. 6,695-7,002 ft.; Nugget 5,418-72 ft. TD 8,086 ft. O'Brien Springs discovery.

Crook County: True Oil Co. 1 Krause, SE¼ 33-49n-68w. IP 470 BOPD, 42°, Dakota 6,474-78 ft. TD 6,623 ft. Opens Coyote Creek field.

Fremont County: The California Co. 1 Government-Langsdorf, Lot 2, 5-38n-91w. IP 38 BOPD, 5 BWPD, Wind River 4,155-78 ft. TD 4,400 ft. Discovery in Lost Cabin field.

KANSAS

Greenwood County: C. L. Lane 1 Lane, SE SW SW 5-26s-12e. IP 8 BOPD, 37°, Mississippian 1,853-60 ft. TD 1,860 ft. Opens unnamed pool.

Harvey County: Kewanee Oil Co. 1 Graber, NW¼ 29-22s-2w. IP 111 BOPD, 32.1°, Simpson 3,676-81 ft. TD 3,769 ft. Opens Alta-Mill pool.

L. D. McJilton 1 Unruh, NW NW NW 23-23s-2e, IP 45 BOPD, 80% b.s. and w., 37°, 2,773-75 ft. TD 3,158 ft. Opens West Branch pool.

Pawnee County: Thunderbird Drilling Co. 1 Phinney, SW SW NE 36-21s-15w. IP 60 BOPD, 21% b.s. and w., 31.2°, Lansing 3,601-08 ft. TD 3,858 ft. Opens Jessie pool.

Reno County: Messman & Rinehart 1 Stroud, NW NW NW 34-23s-5w. IP 81 BOPD, 37.8°, Simpson 3,850-53 ft. TD 3,855 ft. Opens Stroud pool.

Russell County: V-Do Oil Co. 1 F. W. Collins, NW NE SW 16-12s-15w. IP 37 BOPD, 30.6°, Arbuckle 3,241-47 ft. Opens South Brundage pool.

Sedgwick County: O. A. Sutton 1 Buzzi,

SW SW NW 32-25s-1e. IP 148 BOPD, 62% b.s. and w., 38.7°, Hunton 4,436-37 ft. TD 3,478 ft. Opens Buzzi pool.

Trego County: Dunne-Gardner and Benedict Oil Co. 1 Albin, NE NE NW 31-11s-22w. IP 101 BOPD, 41°, Lansing 3,776-82 ft. TD 4,048 ft. Opens Bin pool.

NEBRASKA

Kimball County: Don M. Rounds 1 Towle, C SE NE 10-15n-53w. IP 140 BOPD, 25% b.s. and w., "J" sand 5,563-70 ft. TD 5,642 ft. Opens Towle pool.

Falcon-Seaboard 1 Leafdale, SW SE 22-16n-53w, IP 70 BOPD, "J" sand 5,592-97 ft., 5,591-5,600 ft. TD 5,625 ft. Opens Leafdale pool.

OKLAHOMA

Marshall County: Shell Oil Co. 1 E. S. Nelson, NE SE NW 9-8s-5e. IP 3 BOPD, 30.9°, Des Moines 2,716-50 ft. TD 4,340 ft. New oil pool.

McClain County: Oil & Gas Ventures, Inc. 1 B. E. Barger, C NW SW 6-°5n-2w. IP 443 BOPD, 40°-41°, Hart 7,440-7,538 ft.; Hunton 7,666-7,738 ft. TD 8,759 ft. Hart zone discovery.

Okmulgee County: Snee & Eberly 1 Miller, NW SW SW 25-11n-13e. IP 6,350 M.c.f.d., Jefferson 2,876-86 ft. TD 4,050 ft. Gas discovery.

WEST TEXAS

Crane County: Gulf Oil Corp. 600 W. N. Waddell, 11-3-H&TC Sur., 13 miles east of Grandfalls, 2 miles east of Tucker field. IP 32 BOPD, 20/64-in. choke, 36°, GOR 43,392:1, TP 650 psi., Wolfcamp 5,320-5,420 ft. TD 5,875 ft. Ground elev. 2,449 ft. New pool.

Reeves County: Continental Oil Co. 1 M. M. Knight, 8-C19-PSL Sur., 10 miles northwest of Pecos, no nearby production. IPP 102 BOPD, 34.8°, GOR 129:1, Delaware 4,311-15 ft. TD 4,405 ft., elev. 2,671 ft.

Duncan, Hamm & O'Brien 2 Ward County Irrigation District No. 1, 10-4-H&GN Sur., 9 miles north of Pecos. IP 61 BOPD, 23/64-in. choke, 40°, GOR 416:1, TP 210 psi., Delaware 4,337-44 ft. TD 4,420 ft. Elev. 2,960 ft.

Yoakum County: J. S. Abercrombie et al. 1 A. L. Cone, 332-D-J. H. Gibson Sur., 2½ miles northeast of Plains. IPP 132.4 BOPD, 32.5°, GOR 242:1, San Andres 5,350-60, 5,366-76 ft. TD 5,501 ft. Elev. 3,698 ft. New pool.

COLORADO

Routt County: Tennessee Gas Transmission Co. 1 Andrew McDermott, 24-6n-86w, IP 95 BOPD, Niobrara 4,230-40 ft., 4,174-84 ft., 4,160-70 ft. TD 4,519 ft. Curtis anticline discovery.

Washington County: Huron Drilling Co. and Southern Union Gas Co. 1 Hass, NW SE 15-3s-55w. IP 190 BOPD, 4,924-30 ft. TD 5,045 ft. New oil discovery.

Plains Exploration Co. 1 Yenter et al., "A," C NE SW 15-4s-52w. IP 12 BOPD, 108 BWPD, "J" sand 4,220-24 ft. TD 4,292 ft. New oil pool.

ILLINOIS

Jasper County: Athene Development Co. 1 Ed Fitzmaurice, NE¼ 30-7n-11e. IP 3 BOPD, 2 BWPD, McClosky 2,487-92 ft. TD 2,505 ft. Extension discovery.

Richland County: Perry Fulk 1 J. Alvord, NW NW SW 26-3n-9e. IP 11 BOPD, Rosiclare 3,081-93 ft. TD 3,137 ft. Extension to Clay City Consolidated pool.

Wayne County: T. R. Lindsay 1 Anderson, NW SE NE 20-2n-6e. IP 44 BOPD, 120 BWPD, McClosky 3,185-89 ft. TD 3,254 ft. Extension to Zenith pool.

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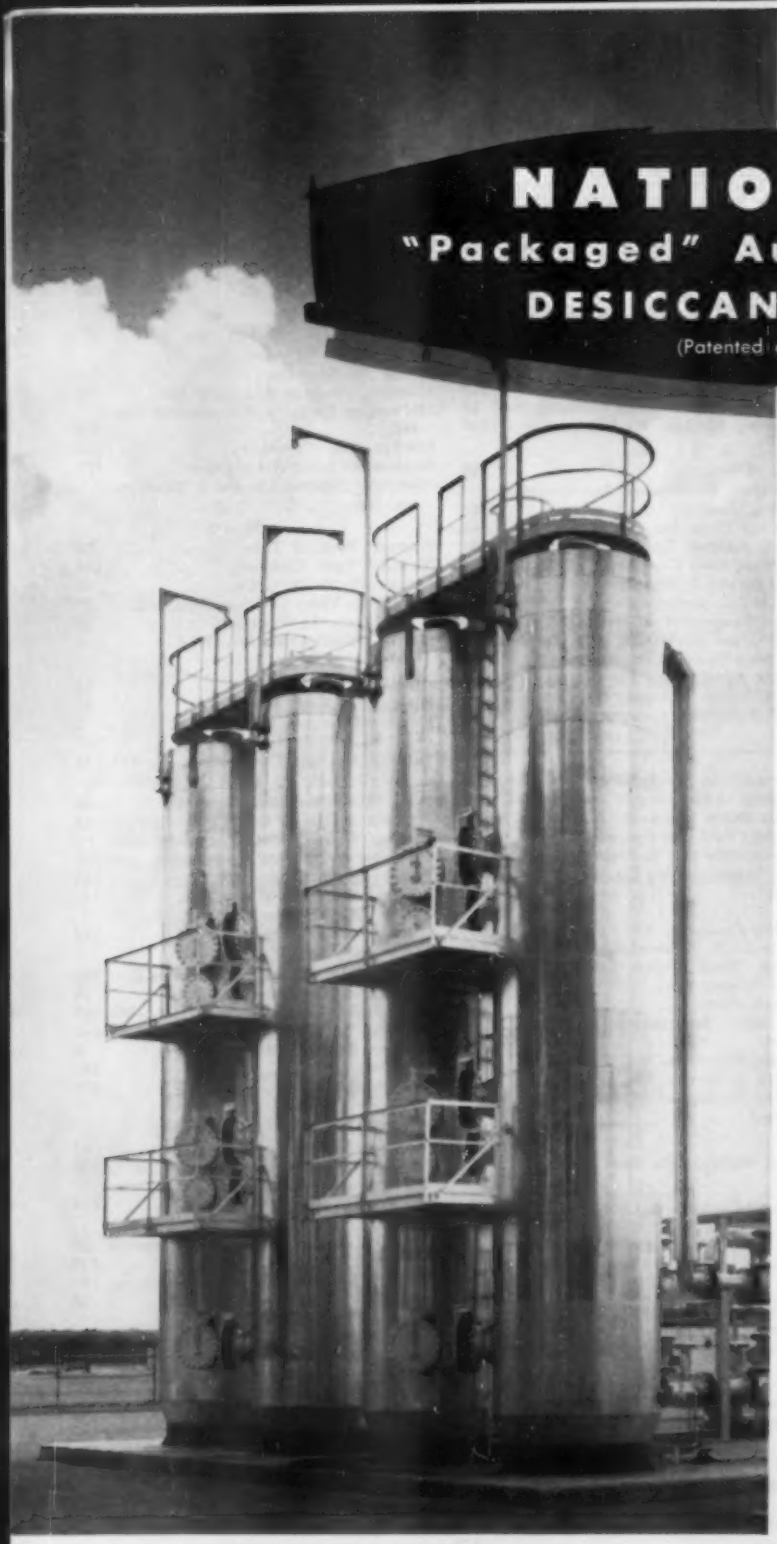

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HUGHES ENGINEERING AND RESEARCH LABORATORY

PART OF EVERY DOLLAR you invest in Hughes rock bits and tool joints goes into research. *And it comes back to you in improved products* that help you get holes down faster and at lower cost.

Not only has Hughes' half century of aggressive research resulted in the continued improvement of rock bits and tool joints, it has contributed materially to the advancement of drilling techniques.

HUGHES TOOL COMPANY